JUL/AUG 2018 Vol.5 No.5

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Inside

Jul/Aug 2018

ON THE COVER

The DAMM BS422 MultiTech platform is an outdoor base station featuring four technologies in one box, suitable for operators' needs today and tomorrow with a technology-independent solution featuring multi-technology, multi-frequency, multi-carrier and simulcast in the one unit.

Multi-technology: the BS422 features four in one box: TETRA, DMR Tier III, TEDS and analog. Multi-frequency: extended coverage is achieved by supporting VHF and UHF mode in all technologies. Multi-carrier: it provides a flexible, cost-efficient solution by enabling up to four logical carriers in one box, and even combining multiple technologies in one box. Simulcast: available for DMR and analog, and also offering repeater functionality for TETRA and TEDS.

The BS422 can be used outdoors in hybrid mode, enabling operators to run, for example, one carrier in TETRA, the second in DMR and the third in TEDS, thereby enabling cross-technology communication. It's also possible to use different technologies at different sites and combine them into one network with a single, central subscriber register. This core-connected design also means that subscribers, network settings, logging and different interfaces are the same across all technologies. This in turn simplifies training and application development and increases flexibility with regard to changing or combining technologies.

The system offers a flexible, scalable and intelligent critical radio and broadband communication solution for a multitude of users, in a multitude of applications and industry sectors.

Damm Australia
www.damm-aus.com.au

Transmit

Public safety mobile broadband (PSMB) is a subject of vital importance to the safety and security of all Australians, so it was heartening to hear, at Comms Connect Sydney, of the progress being made in the provision of this capability for our nation. Luke Brown, from the Department of Home Affairs, told the assembled audience that the aim is to have a national plan in place by the end of this year. That's great news. And it looks like the federal, state and territory governments are leaning towards a hybrid commercial MVNO plus RAN model. That, too, is great news for those who feared that a fully commercial model (which is the cheapest option, according to the Productivity Commission's report) would be chosen.

Of course, the devil is in the details as they say, so it remains to be seen exactly what the model will be, how spectrum will be allocated and so on. The communications industry, emergency services agencies and others will be awaiting further developments with baited breath.

Meanwhile, FirstNet in the US is going ahead in leaps and bounds. Bill Schrier gave the Comms Connect audience a detailed update of the network's capabilities both now and into the future. The US certainly seems to have gotten it right with this one.

And what a great event Comms Connect Sydney was. Those who attended were treated to some very important industry updates from local and international comms leaders, and a buzzing exhibition floor in the new venue at Rosehill Gardens. Paul Davis and the team are to be congratulated on staging another excellent event, and everyone is now looking forward to seeing what's in store for Melbourne.

Jonathan Nally, Editor
jnally@wfmedia.com.au

Calendar

July 2018

Comms Connect Brisbane
26 July
Rydges South Bank
brisbane.comms-connect.com.au

August 2018

APCO18
5–8 August
Las Vegas
apco2018.org

SAFETYconnect 2018
29–30 August
Brisbane Convention & Exhibition Centre
safety-connect.com.au

September 2018

AFAC18
5–8 September
Perth Convention & Exhibition Centre
afacconference.com.au

Electronex 2018
5–6 September
Rosehill Gardens, Sydney
electronex.com.au

November 2018

MilCIS 2018
13–15 November
Canberra
milcis.com.au

Comms Connect Melbourne
20–22 November
MCEC, Melbourne
melbourne.comms-connect.com.au

For a full list of industry events, see criticalcomms.com.au/events

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CHALLENGES FOR SPECTRUM REGULATORS

Giles Tanner, General Manager, Communications Infrastructure Division, ACMA

New technologies and increasing demand for spectrum are pushing regulators to redefine the way they do business.

Spectrum regulators all round the world face challenges as they work with industries that are both leading and undergoing significant technology change and disruption.

With 160,000 licences for radiocommunications services on issue, it might surprise you to learn that the ACMA's staff spend little time poring over licence applications from would-be spectrum users; what we do is arrange things in ways that, as far as we are concerned, administer themselves.

We do this by making class licences, so spectrum users can do a whole lot of things without going anywhere near us, provided they use kit that complies with a few basic rules. We also license large blocks of spectrum to individual users — spectrum licences — and those users have considerable flexibility as to what they do in those spectrum blocks. So nowadays a lot of 're-farming' is done without reference to us; for example, when mobile carriers move customers from 2G to 3G or 4G wireless broadband services.

For the many bands that are host to multiple, smaller users, this process is largely automated. The actual work of coordinating new licences with existing services in each band is mostly now undertaken by third parties, such as Peter Hilly (Spectrum Engineering Australia), who have obtained accreditation from ACMA to do that work.

This is a significant change from the days when coordination was exclusively undertaken by the regulator. The accreditation arrangements commenced in 1997. By 2008, approximately 70% of all coordination work was carried out by accredited persons. Currently, over 95% of all coordination work is by accredited persons. As a result, the ACMA's direct role is mainly restricted to developing and keeping current the rules that accredited persons use for assigning new licences — rules that we call Radiocommunications Assignment and Licensing Instructions, or RALIs.

Technological and market changes in spectrum use can mean these arrangements we have made in bands are no longer optimal and are in fact hindering Australians from getting the best value out of spectrum. And the rate at which this is happening seems, if anything, to be speeding up.

The ongoing evolution and growth of the internet is a major culprit, manifesting as continuing soaring demand for wireless broadband connectivity and, now, the emergence of the Internet of Things (IoT). This is driving growing and changing demand for spectrum from Australia's innovative satellite and space industry, from wireless broadband providers, eg, for 5G, from other existing spectrum users seeking to adapt and respond to all these changes, and from emerging new spectrum users, including utilities, the automotive industry, over-the-top service providers such as Facebook and start-ups.

As a regulator, the ACMA needs an accurate understanding of changes in technology and market demand, both for new and existing spectrum uses, to inform the way we plan and make spectrum available. For that, we rely heavily on spectrum users to keep us informed.

The ACMA's spectrum management team knows a lot about spectrum planning, satellite coordination, diagnosis and investigation of interference, the conduct of online auctions and a whole lot of other stuff that comes with the 'spectrum town planner' role. But our knowledge of what spectrum users actually do with the spectrum is often limited or dated. We depend on the ongoing engagement we have with many of our spectrum users, equipment vendors and technology companies, who provide us with information about technology developments and their market environment.

To give voice to spectrum requirements of SMEs, we get help from peak bodies — such as ARCIA — to tell us what is most relevant to our work. To be frank, our relationships are probably better with established spectrum users than with the start-up end of the business, and here we are helped by initiatives such as the Internet of Things Alliance Australia.

The information we obtain is vitally important to the ACMA to anticipate where changes may be needed to existing spectrum frameworks, and to identify where there are opportunities to achieve more efficient spectrum use.

Technology environment challenges

Spectrum planning has a very strong international dimension, with the ACMA and other regulators engaging with industry in ITU processes, such as the World Radiocommunication Conference, and regionally through the Asia–Pacific Telecommunity. Many of the biggest changes affecting Australia's use of spectrum begin here.

In terms of domestic issues, however, a key way we inform ourselves about the changing technology environment affecting spectrum is through our Five Year Spectrum Outlook, or FYSO. We released a draft FYSO for consultation in May.

The FYSO contains a draft Annual Work Program for each coming financial year. From this year onwards, ACMA intends to consult

with industry on a draft of each year's update before it finalises the Annual Work Program. Once the Radiocommunications Bill passes into law, this will become a legal requirement. Settling our work program in consultation with industry should help us to manage the many competing demands on our attention, and set priorities for our work, in a way that is open and accountable to spectrum users.

A second use of the FYSO is to provide band-by-band information to industry about any domestic or international pressures that may be building up on existing regulatory arrangements in a band. So in this year's FYSO you can read, for example, that ACMA is monitoring international developments on the 600 MHz band that is currently used locally, and in many other countries, for UHF television. This follows moves in the United States to clear television services from 84 MHz of the 600 MHz band to make way for a 5G wireless broadband coverage layer.

The FYSO also notes there are no plans for TV to move (which would be a pretty massive operation), but that the federal government — which happens to use or, in some cases, not use, 50% of the TV bands — might one day be a seller of some of its share.

By recognising that arrangements sometimes come under pressure to change, this is one way we hope to build confidence in spectrum access arrangements, noting that many licences — though not, as it happens, TV licences — are actually renewed on only a year-by-year basis.

The draft FYSO and Annual Work Program outlines our response to these various spectrum demand pressures as it affects the ACMA's day-to-day job of spectrum management. We have further divided our planning activities into two main streams of work:

- Major band (re)planning activities to support the establishment of new spectrum uses. This may require the re-farming and reallocation of spectrum from an existing use and users to different a use and users.
- Optimising established planning frameworks for existing spectrum use through updating technical coordination arrangements. This can include addressing sharing demands, defragmentation and optimising planning configurations.

Legislative and policy challenges

We are in the midst of a legislative reform process being managed by the Department of Communications and the Arts, which will deliver a modernised radiocommunications act.

The Bill being developed by the Department will provide the ACMA with broad discretion on the detailed work of designing and implementing many aspects of the new arrangements.

These reforms signal an important shift away from prescriptive primary legislation. The new legislation will replace the detailed black letter law in the *Radiocommunications Act 1992* with powers that are broad, flexible and high level. It will also clarify the respective roles of the Minister for Communications (who will be responsible for policy and strategic direction-setting) and the role of the ACMA, which will be responsible for policy implementation and delivery.

The replacement legislation is expected to shift the centre of regulatory gravity away from the regulator and towards users of spectrum and people and organisations outside of the ACMA. It supports opportunities for greater user involvement in spectrum management and for simplifying regulatory structures and streamlining operational processes.

The reform directions should also support greater market-based activity. Hopefully this should limit the extent to which further direct intervention becomes necessary over time. It should also mean the spectrum demand can be filled more quickly allowing speedier release of communications products to market.

Or that's the underlying vision. To achieve all this, the new draft law will provide the government and the ACMA with a whole new regulatory 'toolkit' to design and implement spectrum management arrangements, including the design of the licensing and spectrum planning system, pricing, equipment regulation and interference management arrangements.

A centrepiece is a single new licence type — called simply a radiocommunications licence — which will eventually replace all apparatus and spectrum licences. We are hoping this will allow us to mix and match the best features of both existing licence types — for example, we could combine the very long tenure and greater tradability of a spectrum licence with the simplicity, variety and ease of creation of today's apparatus licence types.

It will be a shared challenge for all of us to give life to the promise of spectrum reform that lies within the Radiocommunications Bill.

Our vision, and the challenge we have set for ourselves, is to give spectrum users greater freedom, confidence and incentive to maximise the value they get from spectrum.

Implementation of the new radiocommunications legislation throws up a number of challenges for the ACMA, including reform challenges, regulatory design challenges, and implementation and transition challenges.

For spectrum users, the challenges are related but separate. At this early stage of the process, a key one is simply trying to work out what these changes mean in practical terms for them.

I've already mentioned that the new legislation is broad, flexible and high level. I fully expect that many in industry will want to reserve judgement on aspects of the Bill until they have a clearer idea what the ACMA might do with its very broad and high-level new powers.

To this end, the ACMA developed a series of papers that accompanied the first exposure draft of the Bill, which was released for comment last year. Our papers explained in general terms how the ACMA expected to address several key parts of the new arrangements, including the design of the new licensing scheme and how existing services might transition to it.

In relation to licensing, our overarching message was this: we expect transition to take place in an orderly and predictable way, allowing enough time for industry to work with the ACMA on the design of the new licensing scheme and the prioritisation of the

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transition process. Transition of apparatus licences will take place over an extended period — five years from commencement of the legislation — with all existing licensees receiving ample advance notice of the details of any arrangements that will apply to them.

In framing this approach, we were mindful of the old adage, 'first do no harm'. When moving to arrangements designed to increase the confidence of spectrum users, we need to take special care that we don't inadvertently reduce the confidence that already exists.

The next step in development of the new legislation is the release of a second exposure draft of the Bill, expected later this year. This will be important not only for any changes in approach since the first draft, but because we expect it to include details of transitional arrangements, including transition processes for current spectrum and apparatus licences, also the accompanying taxation Bill, and a few other details missing from the first draft, notably the new licensing arrangements for radio and TV broadcasters.

As with the first exposure draft, our intention is to publish shortly after release of the second exposure draft, detailed material for consultation on how the ACMA envisages using its new regulatory toolkit. The additional detail should assist spectrum users to engage with the Department about the eventual shape of the primary legislation. But also, vitally for us, it should allow ACMA to advance its preparations for passage of the legislation, as we will have a lot to do, and are keen to minimise any impact on our business as usual work, as set out in the draft FYSO.

Industry consultation

With the release of a second exposure draft of the Bill, I envisage a very busy period of engagement with industry operators in the design and implementation of new spectrum management arrangements.

In terms of what is coming up and how industry can be involved, in the FYSO we have provided an indication of the key areas of Spectrum Review implementation activity where we are expecting to release information for consultation. This information and the consultation will support our first phase of information.

We expect to release consultation materials dealing with the following parts of spectrum management reforms:

Planning and licensing: The ACMA intends to issue for consultation information about the design of the new licensing system and replacement licences. We also expect to outline approaches to the transition of existing licences during the five-year period of transition.

Discussion of licences to use spectrum without an understanding of the surrounding planning framework is pointless. Much of the value of a licence resides not on its face, but in the planning rules applicable to that band. So the ACMA intends to consult simultaneously on design options for the spectrum planning technical framework under the Bill.

Pricing: To implement recommendations of the government's Spectrum Pricing Review, the ACMA intends to initiate three programs of work:

- Development of Spectrum Pricing Guidelines to provide better transparency and help licensees better understand how the ACMA approaches spectrum pricing.
- A review of how the ACMA administratively prices spectrum and the formula used to set many of the current apparatus licence taxes (recommendation 7).
- Simplifying industry cost recovery arrangements by combining separate taxes into a single radiocommunications licence tax. This is intended to occur in conjunction with the administrative pricing arrangements.

Information will be made available with licensing and planning design options about how the ACMA will approach pricing under the new arrangements.

Equipment rules: We expect to report back to industry on the outcomes of earlier consultations on the new concepts and design principles for equipment rules.

Accreditation arrangements: Opportunities for user involvement will be explored further in the design and development of new accreditation rules, also intended for consultation.

If I can summarise the aim of all this work at its very broadest, it's to enhance market-based activity, encourage increased user and third-party management of spectrum, and improve the efficiency of regulatory arrangements, without inadvertently reducing the spectrum user confidence that already exists — that is, first do no harm in our redesign and implementation.

This last principle is informing a lot of our thinking about how we design new planning and licensing arrangements that give life to the vision of spectrum reforms, but which make sure that you can continue to get a licence that remains fit for your business purposes.

Giles Tanner is General Manager of the ACMA's Communications Infrastructure Division. This is an edited version of his Comms Connect Sydney plenary address.

> THE REPLACEMENT LEGISLATION IS EXPECTED TO SHIFT THE CENTRE OF REGULATORY GRAVITY AWAY FROM THE REGULATOR AND TOWARDS USERS OF SPECTRUM.

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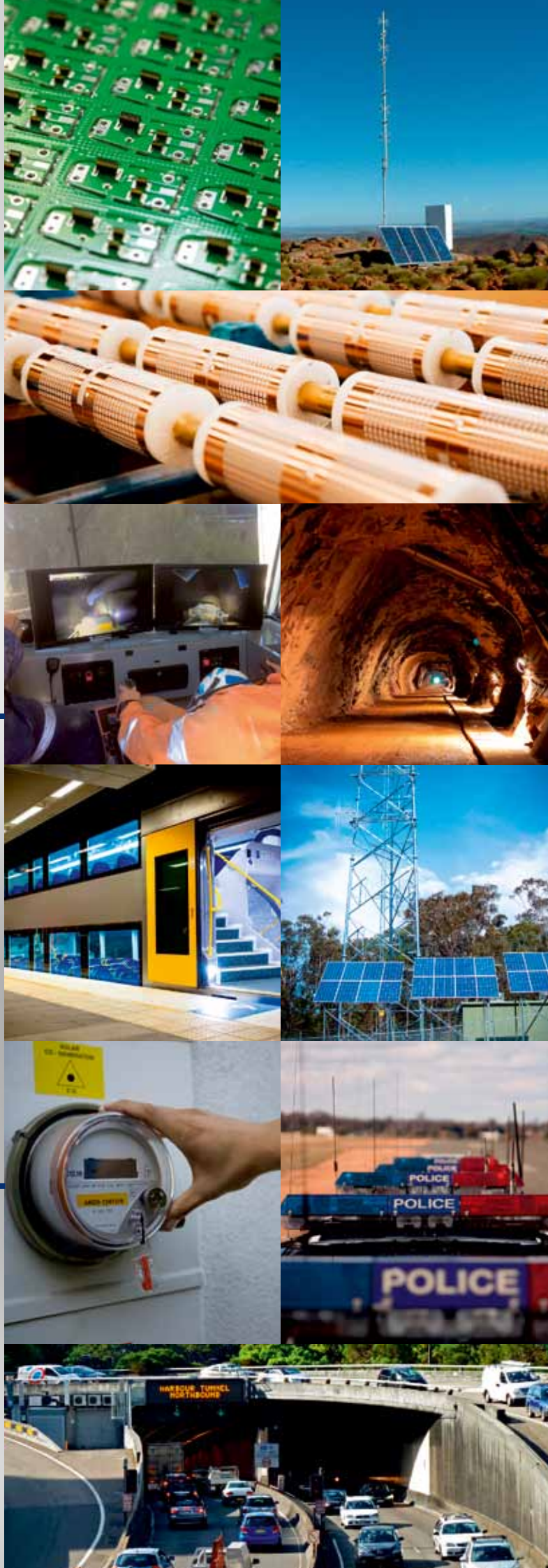


News

MINETEC'S OLYMPIC DAM CONTRACT

Minetec has been awarded a contract to supply a fleet management system for BHP's Olympic Dam mine, including proximity detection, tracking and task management. The contract, with a total estimated value of $9.5 million, was awarded following a competitive tendering process. Approximately half of the system will be delivered in FY18 with the balance in FY19. BHP's Olympic Dam site is a multimineral ore body containing uranium oxide, copper, gold and silver. Minetec, a wholly owned subsidiary of Codan Limited following acquisition in 2012, specialises in high-precision tracking, productivity and safety solutions for underground hard-rock mines.
More info: bit.ly/2K3IGKI

"PLENTY OF LIFE LEFT IN 4G": TELSTRA

There's "still plenty of life left in 4G" according to Telstra's Group Managing Director of Networks, Mike Wright, as the telco pushes forward with increasing network speeds. In June, Telstra, along with Ericsson, NETGEAR and Qualcomm, began testing 2 Gbps over LTE with a prototype commercial device in the Ericsson lab environment in Stockholm. "The results continue to be very positive, again demonstrating that by aggregating 100 MHz of spectrum across various combinations of frequency bands and utilising 4×4 multiple-input and multiple-output (MIMO) technology, speeds of 2 Gbps can be achieved over 4G," said Wright in a blog post.
More info: bit.ly/2tvwAi4

LCR meter

The Hioki 3532-50 LCR Meter has a frequency range from 42 Hz to 5 MHz and a basic accuracy of ±0.08%. With power for maximum high-speed measurements of 5 ms, the product makes it easy to test sample characteristics in the high-frequency range. It is available for rent from TechRentals.

The meter includes a correlation correction function and features interactive touch-panel operation. It can measure 14 parameters, including |Z|, |Y|, θ, Rp (DCR), Rs (ESR, DCR), G, X, B, Lp, Ls, Cp, Cs, D (tan δ), and Q. Any four of these parameters can be chosen for simultaneous measurement and the meter's enlarged display accommodates for situations where the unit is read from a distance.

Frequency, signal level and other measurement conditions can be changed while monitoring the measurement results. This functionality allows for effective trial measurements and setting of evaluation conditions. The instrument includes memory for 30 sets of measurement conditions, including comparator values. Some applications for use include laboratory use for evaluating operating characteristics, production line use, and research and development.

TechRentals
www.techrentals.com.au

Cellular router

The SmartFlex cellular router provides secure internet connectivity for devices and LANs via the cellular networks. It can provide automatic wireless failover for wired networks, wireless connectivity for devices in remote locations where cable connections are impractical and wireless connectivity for mobile assets.

With upload speeds of up to 50 Mbps and download speeds of up to 150 Mbps, SmartFlex provides ample bandwidth, even for applications that require video. SmartFlex has a powerful Cortex A8 CPU at 1 GHz, 256 MB flash memory, 512 MB RAM and 128 kB M-RAM, providing full support for LTE (Long Term Evolution) speeds and applications.

A secure web interface allows users to configure and manage SmartFlex from remote locations. The router can also upgrade its configuration and firmware from the operator's central server, allowing for simultaneous mass reconfiguration of every router on the network. Users may insert Linux scripts and can create multiple configurations for the same router and switch from one configuration to another at any time. Modular SmartFlex can be configured for any application. Standard configuration includes 2 Ethernet ports with 2 independent LANs/IP addresses and also includes 1 USB host port, 1 microSD card holder, 2 SIM card holders for automatic failover to an alternate service provider, 2 binary inputs(I/O), 1 binary output (I/O) and onboard GPS. An optional built-in Wi-Fi module is also available, with industrial-grade operating temperature ranges from -40 to +75°C.

Further optional boards include: 3x ETH (the router can be configured with up to 5 total Ethernet ports and 3 independent LANs/IP addresses) or RS232/485 (isolation strength up to 2.5 kV). The SmartFlex supports real-time data encryption and the creation of VPN tunnels using IPsec, OpenVPN and L2TP. It supports DHCP, NAT, NAT-T, DynDNS, NTP, VRRP, control by SMS and numerous other functions, as well as additional software like SmartWorx HUB and R-SeeNet.

Advantech Australia Pty Ltd
www.advantech.net.au

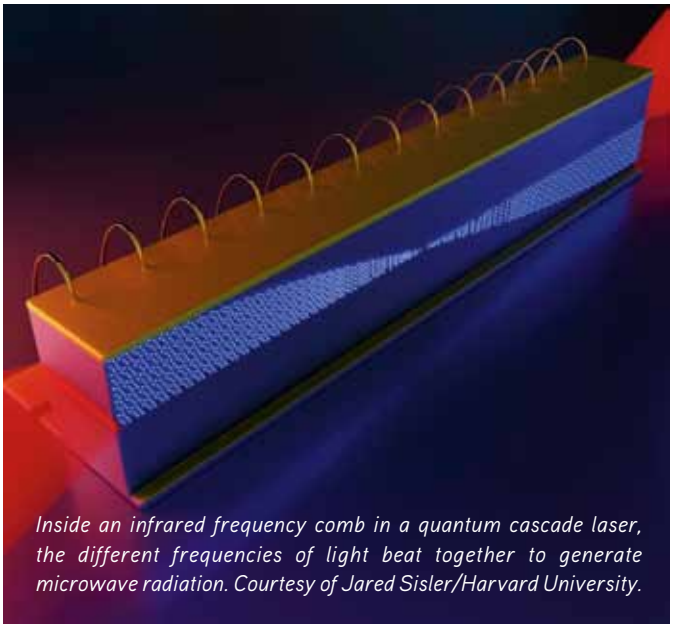
LASERS MAY BE THE FUTURE OF WI-FI

With Wi-Fi and cellular data traffic increasing exponentially and with bottlenecks approaching, many people hope that 5G will be the saviour of the situation. But even the early iterations of 5G won't be able to handle the flood of data forever.

Shifting to terahertz frequencies could the answer, as signals at those frequencies could move hundreds of times more data than today's wireless.

In 2017, researchers at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) discovered that an infrared 'frequency comb' in a quantum cascade laser could offer a new way to generate terahertz frequencies.

Now, the same researchers have uncovered a new phenomenon of quantum cascade laser frequency combs, which would enable these devices to act as integrated transmitters or receivers that can efficiently encode information.



Inside an infrared frequency comb in a quantum cascade laser, the different frequencies of light beat together to generate microwave radiation. Courtesy of Jared Sisler/Harvard University.

"This work represents a complete paradigm shift for the way a laser can be operated," said Federico Capasso, the Robert L. Wallace Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering and senior author of the paper.

"This new phenomenon transforms a laser — a device operating at optical frequencies — into an advanced modulator at microwave frequencies, which has a technological significance for efficient use of bandwidth in communication systems."

Frequency combs are widely used, high-precision tools for measuring and detecting different frequencies of light. But this research wasn't interested in the optical output of the laser.

"We were interested in what was going on inside the laser, in the laser's electron skeleton," said Marco Piccardo, a postdoctoral fellow at SEAS and first author of the paper. "We showed, for the first time, [that] a laser at optical wavelengths operates as a microwave device."

The researchers discovered that light inside the cavity of the laser causes electrons to oscillate at microwave frequencies, and that these oscillations can be externally modulated to encode information onto a carrier signal.

"This functionality has never been demonstrated in a laser before," said Piccardo. "We have shown that the laser can act as a so-called quadrature modulator, allowing two different pieces of information to be sent simultaneously through a single frequency channel and successively be retrieved at the other end of a communication link."

"Currently, terahertz sources have serious limitations due to limited bandwidth," said Capasso. "This discovery opens up an entirely new aspect of frequency combs and could lead, in the near future, to a terahertz source for wireless communications."

The research, published in *Optica*, was supported by the US Defense Advanced Research Projects and the US National Science Foundation.

News

BARRETT SUPPLIES MILITARY VHF

Under an AU$7 million contract, Barrett Communications will provide VHF equipment for an unnamed Middle Eastern military force. Its new client has deployed the equipment as part of a planned modernisation of existing military VHF systems. The contract incorporates the full range of Barrett PRC-2080+ VHF equipment. The PRC-2080+ systems are designed for multirole tactical military applications. This contract also included the hand-portable, manpack, mobile, base station and re-broadcast configuration. The Barrett PRC-2080+ system will provide secure voice and data communications over line-of-sight range. Training was recently undertaken in country, ready for full deployment within the coming months.
More info: bit.ly/2tCK4J4

KEEPING THE COAST SAFE

The Australian Volunteer Coast Guard (AVCG) has put an Omnitronics DX-Altus dispatch system in charge of managing its mission-critical rescue communications across 2512 km of the Australian coastline. The installation has increased the AVCG's reach to remote locations and improved reliability, productivity, access and ease of communications for its 2500 volunteers. Operators now use a single common microphone across all channels, rather than a desk full of individual ones, and they can monitor 23 VHF and HF channels at once. Weather forecasts can now be recorded in advance and sent out to vessels periodically across multiple channels.
More info: bit.ly/2txO4Kz

Handheld computer

The Xplore Technologies M60 is a 6″ rugged, ultra-mobile Android handheld computer.

At 369 g, the M60 is a suitable option for workers who require real-time access to specialised enterprise applications and data, but demand fewer computing capabilities than what are delivered in Xplore's larger tablet and 2-in-1 computers. The M60 is easy to grip for long periods of time, and a wide array of accessories makes it easy to store, transport, and charge.

Notable features of the IP68 handheld include a 6″ FHD 550 nit View Anywhere display, a big and bright glove/wet touch screen, and a 22-hour, user-replaceable battery. The M60 is also MIL-STD-810G-certified to operate after 1.5 m drops and within a -20 to 60°C temperature range.

With the Xplore M60, workers will find it easy to retrieve work orders, complete checklists and view equipment manuals, even when working under direct sunlight, in cold storage or other extreme conditions, with a battery that can last multiple shifts. The handheld's built-in NFC and optional one-touch barcode scanning technology improves the speed and accuracy of picking, packing and loading actions within rail intermodals and shipyards, cargo holds and other facilities where fast quality and quantity validations are required.

The M60's many built-in connectivity tools will also benefit utility, energy and field service organisations that need a better way to automate data entry and retrieval across inspection, maintenance, delivery and installation workflows. The MDM/EMM-certified rugged handheld utilises a number of built-in wireless technologies to expedite data and voice communications between the field and office, including those required to remotely manage, upgrade and lock down devices. The Android for Work whole-device encryption and whitelist capabilities maximise security.

XploreTechnologies
www.xploretech.com

Mobile radio

The Motorola Solutions APX 8500HP mobile radio is a high-power version of its interoperable all-band Project 25 mobile radio.

The 110 W radio delivers more than twice the power of the APX 8500 for VHF and UHF Range 1 bands.

It is suitable for use in rural areas or during disaster response where limited infrastructure might be available. With all-band functionality, first responders from different agencies can easily communicate with each other, regardless of what frequency band they are using.

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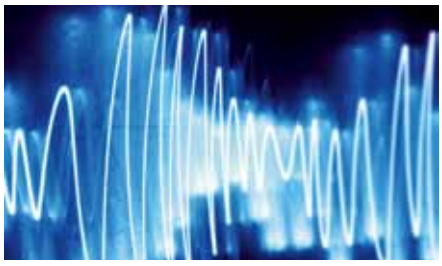
News

WHOLESALE BUSINESS SATELLITE SERVICE

nbn co will use underutilised Sky Muster spectrum to provide a new wholesale Business Satellite Service aimed at remote and rural businesses. "We understand the impact providing access to fast broadband for businesses may have on opening up new market opportunities, driving innovation and increasing productivity," wrote nbn co's Executive General Manager for Access Products, Gavin Williams, in an announcement on his nbn co blog page. According to Williams, the Business Satellite Service will "support online applications such as video conferencing and cloud-based services" and is "designed to help businesses with online storage and backup network solutions, as well as provide critical communications support to disaster-recovery operations".

More info: bit.ly/2ltMqWP



REGISTER FOR RADCOMMS 2018

Spectrum management conference RadComms offers a chance to meet key decision-makers from government and industry, while hearing about major issues and developments. Those in the industry can now register for the event, which will be held from 30–31 October in Sydney. Under the theme 'Delivering the future', the event will explore the increasing importance of spectrum as an economic enabler for the digital and connected economy — how will spectrum enable the applications and technologies that will shape our commercial, social and individual futures? The latest updates on RadComms 2018, including speaker and program information, will be included on the ACMA website.

More info: bit.ly/2yMHrdx

Remote power monitoring system

The Helios Power Solutions RMS-300 Super Remote Monitoring System is a remote voltage monitoring, data acquisition and control device designed for use with battery-powered wireless internet repeater sites or other AC- and DC-powered remote equipment. The RMS-300 has ultralow power consumption (1.2 W) and is powered by DC voltage from 10 to 60 V.

The RMS-300 uses embedded Ethernet technology for internet data acquisition and remote voltage monitoring, enabling the user to monitor voltage at remote repeater sites. It uses the LINUX operating system for versatility, stability and security. The unit is designed to give the user the situational awareness needed to keep equipment operational and reliable.

Helios Power Solutions

www.heliosps.com.au

Marine handheld radio with land mobile features

The Icom IC-M85E marine handheld radio with land mobile features is compact and powerful. It is a suitable for communication in commercial environments.

The radio measures 56 W × 92 H × 29 D mm and is lightweight (246 g), with BP-290, FA-SC58V and MBB-3.

The radio provides faster and more effective communication. It offers three alarm-related functions which include MOB (man overboard), man down and lone worker. In addition to VHF marine channels, the radio also covers 136–174 MHz LMR channels. It has up to 100 programmable channels available for LMR use. Each channel is programmable with CTCSS and DTCS tone. The multifunction button provides instant operation of the channel group changing from Marine to LMR or vice versa.

Despite its compact body, the radio delivers 700 mW of loud audio as clear communication in noisy environments. It is built durable to endure 1 m submersion for 30 min and dust-tight protection. The radio has also passed MIL-STD-810 specifications.

To ensure and uphold conversation privacy, the radio has a built-in voice scrambler which offers private communication between stations (32-code, compatible with UT-112 voice scrambler unit).

The radio also comes with several other features including Aqua Quake, internal VOX capability for hands-free operation, 14 h of battery life, 5 W output, dual/tri-watch function for monitoring CH16 and/or call channel.

Icom Australia Pty Ltd

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Introducing the CM60 Series

Designed, engineered and manufactured in Australia for the toughest conditions, the CM60 Series provides a robust solution ideal for both the large systems integrator with an extensive network of mobiles, portables and repeaters, or the small operator with a single site.

The CM60 Series provides an analogue solution with optional licensing upgrades for P25 in Conventional, Trunk and AES 256-bit Encryption.

The advanced User Interface Control (UIC 600 Series) features an OLED screen for high-visibility characters, back-lit keypad, powerful front facing speaker and a secure in-vehicle interactive bracket.

All CM60 variants are compliant with AS/NZS 4295 (LMR). UHF variants are compliant with AS/NZS 4365 (CB) and all P25 variants are CAP (Compliance Assessment Program) compliant, conforms to TIA-102 Standards and are FCC Parts 90/15 compliant.

GME PROFESSIONAL

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AUSTRALIAN MADE

P25

ROBOTIC ANTENNA TESTING

A dual robot arm system is helping researchers test the next generation of antennas for the coming 5G revolution.

A new test facility belonging to the US National Institute of Standards and Technology (NIST) is enabling researchers to pioneer new antenna measurement methods, with future 5G systems in mind.

The Large Antenna Positioning System (LAPS) has two robotic arms designed to position 'smart' or adaptable antennas.

LAPS can test transmissions to and from antennas located on fast-moving mobile devices, which requires coordination between the timing of communication signals and robot motion.

"Measurements of antenna signals are a great use for robotics," NIST Electronics Engineer Jeff Guerrieri said. "The robotic arms provide antenna positioning that would be constrained by conventional measurement systems."

NIST is still validating the performance of the LAPS and is beginning to introduce it to industry. The system was described at a European conference in early April.

It is hoped that LAPS will contribute to the development of transmitter antenna arrays with tens to hundreds of elements that focus the antenna power into a steerable beam that can track mobile devices operating in the 30 to 300 GHz range.

The dual-robot system will also help researchers understand the interference problems created by ever-increasing signal density.

The new facility is the next generation of NIST's Configurable Robotic Millimeter-Wave Antenna (CROMMA) Facility, which has a single robotic arm. CROMMA, developed at NIST, has become a popular tool for HF antenna measurements.

Companies that integrate legacy antenna measurement systems are starting to use robotic arms in their product lines, facilitating the transfer of this technology to companies such as Boeing.

As CROMMA can measure only physically small antennas, NIST developed the LAPS concept of a dual robotic arm system — one robot in a fixed position and the other mounted on a large linear rail slide — to accommodate larger antennas and base stations.

Designed and installed by NSI-MI Technologies, LAPS has a radar designed to prevent collisions of robots and antennas within the surrounding environment, and to protect operators.

The system's measurement capabilities for 5G systems include flexible scan geometries, beam tracking of mobile devices and improved accuracy and repeatability in mobile measurements.

The LAPS has replaced NIST's conventional scanners and will be used to perform near-field measurement of basic antenna properties for aerospace and satellite companies requiring precise calibrations and performance verification. The near-field technique measures the radiated signal very close to the antenna in a controlled environment and, using mathematical algorithms developed at NIST, calculates the antenna's performance at its operating distance, known as the far field.

But the ultimate goal for the LAPS is to perform dynamic, over-the-air tests of future 5G communication systems. Initial validation shows that basic mechanical operation of the LAPS is within the specified design tolerances for still and moving tests to at least 30 GHz. Final validation is ongoing.

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HACKATHON TACKLES HAZARDS

Jonathan Nally

Emergency services stand to gain from a new app concept that lets citizens report natural hazards.

A Swinburne University student team has won the $25,000 Motorola Solutions 2018 Public Safety Hackathon prize for its hazard reporting app concept.

Swinburne's concept enables citizens to use smartphones to capture images of fallen trees and other obstacles, and uses software to accurately measure the size of hazards. It also enables real-time reporting of road conditions.

This kind of data can be vital in helping emergency services to dispatch the most appropriate resources to an incident and work out the best and safest route.

The Victoria State Emergency Service (VICSES), one of four public safety organisations taking part in the event, set the challenge won by the Swinburne team.

2016–17 was VICSES's second busiest year on record, during which the organisation responded to more than 31,000 incidents and provided more than 302,600 hours of operational support time.

"Before the hackathon we had no idea that we could apply the skills we are developing at university in this way," said Nami Shah from the winning Swinburne team.

"It has been so rewarding to learn that our apps can help public safety agencies to work more efficiently while making our communities safer. We have gained great confidence from the hackathon and now plan to develop our app further by adding multimedia and social media components to it," Shah added.

Pictured: The Motorola Solutions 2018 Public Safety Hackathon winning team from Swinburne University: Anh (Ken) Tran, Nami Shah, Andreas Loannidis, Mathew Wakefield.

"It would be a dream come true if we could put our app into the hands of public safety agencies and citizens across the country."

The hackathon took place over 44 hours and brought together a mix of app developers and emergency service organisations.

The set of challenges thrown at the contestants was the most diverse in the event's three-year history.

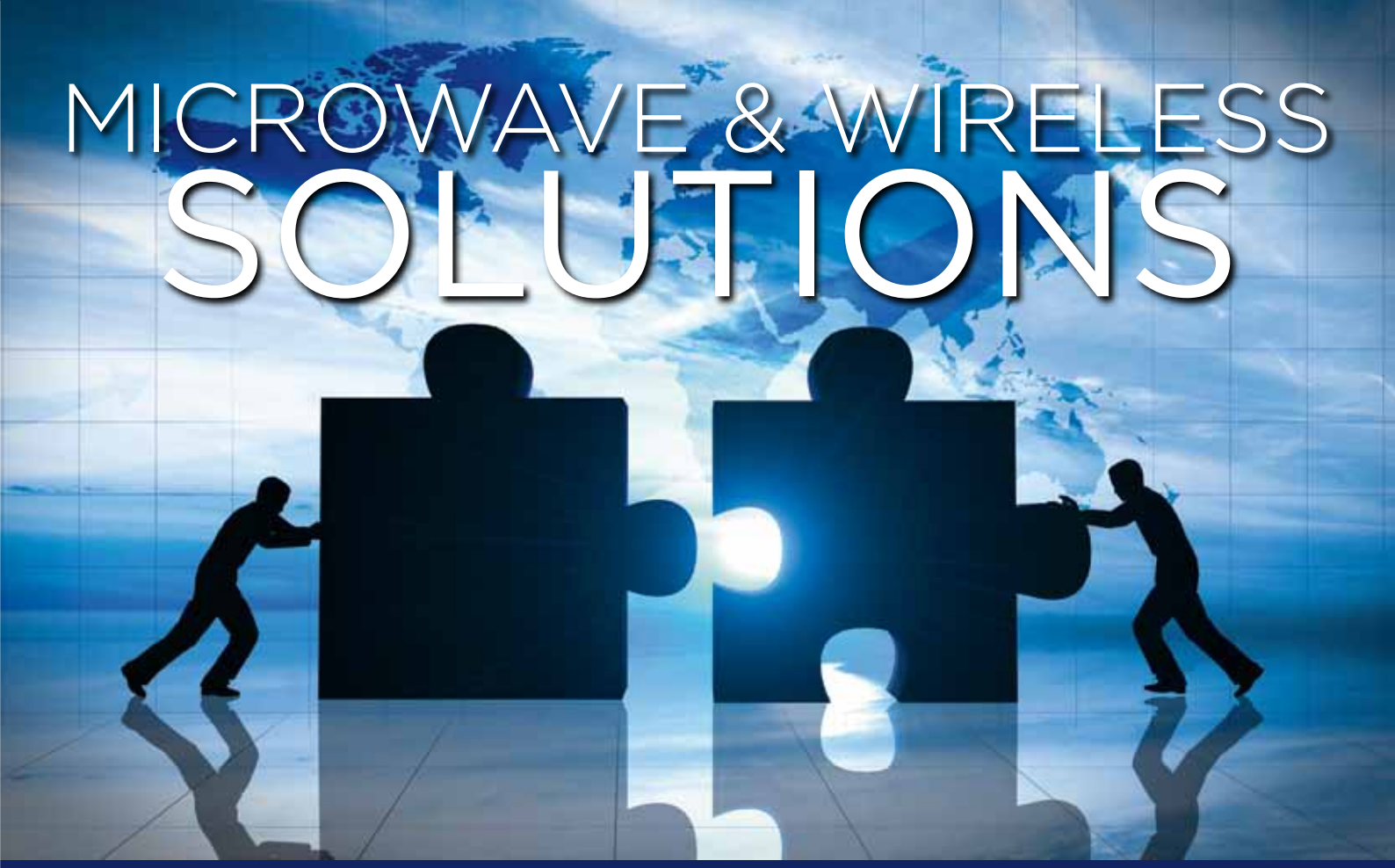
One thing that became clear during the course of the event was the increasing need for new technologies to boost citizen engagement with public safety authorities.

"It is becoming increasingly important for emergency services to access more of the vital data that Australian citizens can capture using smartphones," said Steve Crutchfield, Vice President and Managing Director for Motorola Solutions Australia and New Zealand.

"Citizens have an important role to play in protecting their communities, and by providing first responders with the right data at the right time, we can all have a profound impact on the future of public safety.

"As Motorola Solutions celebrates 50 years in Australia, hackathons, agile development practices and partnerships are helping us to develop new skills and capabilities while accelerating innovation and service delivery for our customers," Crutchfield added.

MICROWAVE & WIRELESS SOLUTIONS



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Troop-protection devices that counter IEDs have been provided to the Afghanistan National Defence and Security Forces. Dept of Defence image by SGT Ray Vance.

AUSSIE ANTENNAS

SAVING LIVES IN AFGHANISTAN

East Gippsland company ZCG has received a significant contract to supply high-end antennas for the Australian Department of Defence as part of technology designed to keep troops safe from explosions in the field.

The advanced troop protection system, designed by the Defence Science and Technology Group and manufactured by L3 Micreo in Brisbane, includes custom-made antennas, designed, tested and manufactured at ZCG's Lindenow head office.

The locally made antennas are a critical component of the suite of robust troop-protection devices specifically designed for the Afghanistan National Defence and Security Forces, for use by troops on foot and mounted in light vehicles.

"The ZCG technical team spent six months last year working with our partners in Defence to develop antennas for devices that block radiofrequency transmission so enemy combatants can't remotely trigger improvised explosive devices (IEDs)," ZCG Managing Director Garry Kelly said.

"Our antennas play an important role in keeping troops safe from IEDs in conflict zones around the world."

The REDWING counter-IED devices have been provided to the Afghanistan National Defence and Security Forces. Dept of Defence image by SGT Rob Hack.

This is the second time the company has worked with Defence and L3 Micreo on this project, known as REDWING.

"Over the past two years, we have supplied more than 150,000 antennas, on time and on budget, for the first version of this technology," Kelly said.

"But this contract takes our business to a whole new level. As a small rural enterprise, we had to step up and increase our capability so we were eligible to win larger, more complex defence contracts."

Kelly said ZCG has worked hard to improve its systems to ensure it meets the minimum criteria for engaging with major defence players.

It renovated and restructured its Lindenow head office and completed a lean manufacturing and continuous improvement program run by Melbourne consultants OPTIM Improvement and co-funded by East Gippsland Shire Council.

The program helps local businesses to structure and operate their workplaces to be more competitive in domestic and export markets.

The Australian Minister for Defence Personnel and Veterans Affairs and Federal Member for Gippsland Darren Chester said it was a great achievement for regional businesses, such as ZCG, to win significant national contracts.

ZCG offers off-the-shelf and customised solutions to customers around the world, such as vehicle-mounted antennas, marine antennas, base station antennas for police and emergency towers, and custom-designed broadcast antennas that enable radio and TV broadcasters to deliver high-quality, targeted signals. Autonomous haul trucks in the mining industry also rely on its products.

ZCG has earned certification for the ISO 9001: 2015 Quality Management Standard, which means the company is operating at an internationally recognised standard. It also is now qualified for the ISO 14001: 2015 Environmental Management Standard and AS/NZS 4801:2001 Health and Safety Management Standard.

"ZCG is proud to be supplying life-saving antenna solutions for domestic international troops in conflict zones around the world and will continue our dedication to supplying high-quality antennas for the defence force, emergency services and other ongoing projects," said Kelly.

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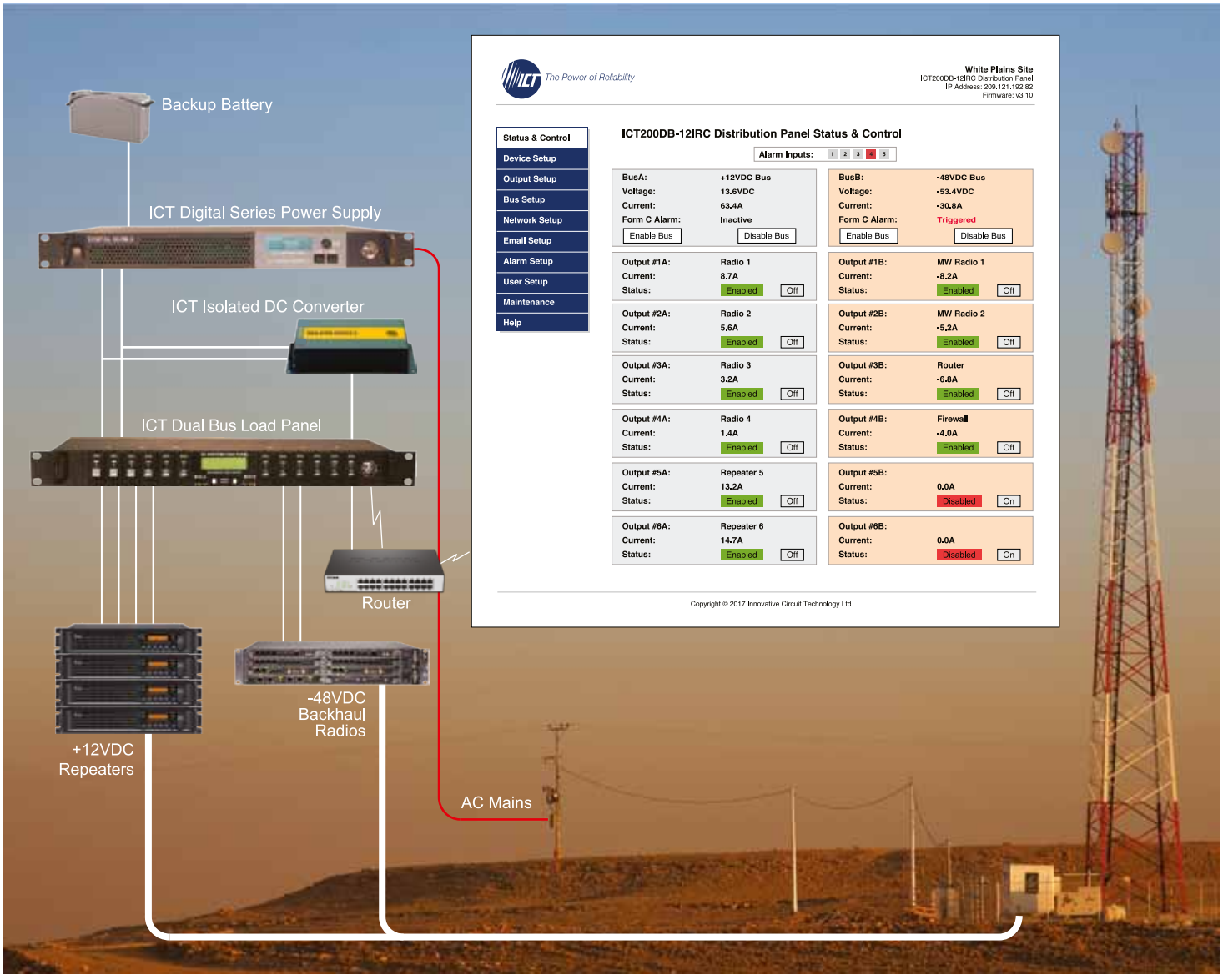

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Antenna alignment tool

The 3Z Telecom RF Vision Antenna Alignment Tool enables users to efficiently conduct precise antenna alignment on panel and microwave point-to-point antennas. The tool ensures that installers perform jobs as indicated in RF design specifications. It is available to rent from TechRentals.

Inaccurately installed antennas can cause coverage gaps, network performance degradation, loss of voice quality, and traffic. The high-performance 3Z Telecom RF Vision is designed to provide accurate and reliable results to avoid the consequences of poorly installed antennas.

The 3Z Telecom RF Vision has a built-in HD camera that provides an augmented reality line-of-sight image, viewable on its 5″ touchscreen LED display. This antenna tool features an easy-to-use graphical user interface and creates comprehensive reports which are downloadable via the micro-USB port (in PDF and CSV formats).

TechRentals

www.techrentals.com.au

PTT radio

A Telstra-approved 4GX/4G/3G modem powers the IMPULSE Wireless VM1, which has the form factor of a radio. Combining the reliable coverage and performance of PTT with the ease of use and simple operation of a radio is the key benefit of this mobile network radio.

The IMPULSE Wireless VM1 has a front-facing speaker, which provides loud and crystal clear audio. It also has a rugged fist microphone, programmable function buttons, a colour touch-screen and supports Bluetooth. It can run all Android applications as well as providing secure two-way communications, enhanced GPS tracking and live location services, sending SOS/duress alerts, messaging and statuses.

The product offers coverage, performance and flexibility of PTT combined with the ease of use and familiarity of a radio.

IMPULSE Wireless

www.impulsewireless.com.au

Fusion splicers

The Fujikura 70S+, 70R+ and 62S+ splicers offer Bluetooth capability to wirelessly communicate parameter settings with a smart device.

The 70S+ offers high speed — with a 6 s splice time and 9 s heat/shrink time. It also offers programmable features, such as an automated wind protector and independently programmable sheath clamps that reduce splice time and increase productivity. It offers a long life battery providing 200 splice/heat cycles and long-life electrodes that provide up to 5000 splices.

An economical alternative to the fully automated 70S+, the 62s+ uses a conventional wind protector and tube heater design. With a 23 s shrink time, the 62S+ offers a high level of productivity.

The 70R+ is a fast and rugged ribbon fusion splicer. Splice/heat cycle time has been reduced to just 18 s (using FP-04(T) splice protectors), with battery life of 110 splice/heat cycles and extended electrode performance of 1500 splices per set.

These latest models include all the features of previous models — fuse connect compatibility, a large monitor, built-in instructional videos and a fully ruggedised design that is shock, dust and rain proof.

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ICOM CERTIFIED PARTNER NETWORKING

AUSTRALIA'S PSMB IS PROGRESSING

Jonathan Nally

There is light at the end of the tunnel for the provision of public safety mobile broadband for Australia.

A few days before Christmas 2017, the federal government established a new super-department called the Department of Home Affairs, which took on the responsibility for border protection, security, policing, emergency management and public safety communications at the national level.

Part of its remit is the facilitation of a national public safety mobile broadband (PSMB) communications network with states and territories, a capability that is already being implemented in several other advanced economies and which many have argued is long overdue in Australia.

Attendees at the Comms Connect conference in Sydney were given an update on efforts to establish such a network, during a panel session attended by industry and government experts, including Luke Brown, from the Department of Home Affairs. Brown has been given the responsibility for overseeing the body of work that is happening between the states, territories and the Commonwealth, to progress a PSMB capability in Australia.

"What I've seen in the six months since the establishment of the Department, has, I think, been very positive for issues like the one we're talking about today," said Brown. "There is now a focal point inside the Australian Government, focused in a very direct way… on issues of security and emergency management."

Brown acknowledged that PSMB has been an issue that has been kicked around within governments in Australia for close to a decade, but said that progress is being made.

"We've been through a lot of processes to get to where I think we are now," he said, adding that "I think in the last 18 months or so, there's probably been more progress made on public safety mobile broadband in Australia than had been made in the eight or so years leading into that."

Brown said that a turning point came last year when Australian representatives

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> THE AIM WITHIN THE PARTNER GOVERNMENTS IS TO HAVE SOME FORM OF NATIONAL ARRANGEMENT BY THE END OF 2018.

undertook some overseas fact-finding missions and struck up good relationships with "like-minded partners" in FirstNet in the USA, as well as in the United Kingdom, Japan, South Korea and Europe. Brown said that when the Australian delegation returned from Washington last year, "the advice that we were putting to governments at that time, collectively, was, 'We're behind the eight ball. Our Five Eyes partners are well and truly ahead of us, so we've got to pick up our game.'"

But he went on to say that, having just attended a Public Safety Communication Europe meeting in Brussels, "I'm really pleased to say… that I think, internationally, Australia and its consideration of this issue in government has well and truly caught up."

Brown said that there is now a national consensus around a set of 10 national objectives for a PSMB capability that has been endorsed at the highest levels — ie, the Council of Australian Governments, or COAG, level — which "is no mean feat at all".

"We also, with the help of some very learned people in the Bell Laboratories in the US, prepared a set of high-level requirements which for the first time really do describe… what those requirements are that our agencies [need]," he said.

"So we've got a set of national objectives, we've got a set of high-level requirements."

Around the same time as the Department of Home Affairs was created, an RFI addressing those objectives and requirements was put out to market. "I personally was remarkably overwhelmed by the response to that request for information," said Brown. "What came forward were a number of ways the governments could go. It really did become quite clear that, pragmatically, there is an ability within Australia for an end-to-end capability, and there is an ability probably for something that would be akin to some form of what I refer to as a commercial hybrid arrangement, which is a multicarrier arrangement — effectively an MVNO carrier model plus RAN.

"So in that 12 months, we worked out what we want, we described what we want in a way people can understand, we've gone to market as a bit of a first phase just to get that information, and we have then started a conversation between governments about how we might [implement PSMB]," he added.

Brown said that the various governments are working very hard behind the scenes to progress the PSMB project, but acknowledged that there hasn't been a great deal of information forthcoming since the RFI process was put into the market.

"Please don't in any way read into that that governments have gone quiet on this — they certainly haven't," he said. "We are working very hard pulling together options… that deal with, amongst other things, issues around spectrum and other considerations that we need to be factoring in."

Brown said that the aim within the partner governments is to have some form of national arrangement by the end of 2018.

"I'm relatively confident, based on the really effective relationships that have been forged between the Commonwealth and the states, and certainly those initial interactions with industry, that we'll get there," he said.

Brown added that industry should keep an eye out for an imminent approach to market for conducting a 'proof of concept' demonstration for a commercial hybrid solution, subject to governments finalising their position for a national model as well as an implementation timetable.

In summarising the situation, Brown said, "We're now ahead of certain countries that we were well and truly behind. That's a good thing. We've got ourselves organised within governments [and] are all now speaking in very similar language. We're determined and committed to working very closely with industry to deliver a meaningful outcome."

ANNOUNCING THE ACRNA

Jonathan Nally

Australia now has its own peak body for mission-critical control room operators.

A new association charged with representing the interest of, and fostering information exchange between, control and dispatch room operators has been established in Australia. The formation of the Australian Control Room Network Association (ACRNA) was announced at the Comms Connect critical control rooms workshop in Sydney by Mark Holmes, Co-Founder and Secretary of the ACRNA and Chairman of Circadian Australia.

Holmes told the Comms Connect audience that, over the past several years, representatives from organisations that operate control rooms as an integral part of their business have attended an annual conference to share operational experiences and to meet with others who offer support services. Those services cover fields such as ergonomic advice, enhancing control room operator sustainable shift work performance, safety and control room design. Industries that were represented included oil, gas, electricity, ports, air, road and rail.

At the 2016 conference, attended by more than 100 delegates, it was agreed that it was time to establish a new non-commercial association, run by the industry, for the industry.

According to Holmes, the association will facilitate collaboration between organisations that operate control rooms as well as with supporting industries. This collaboration will provide the means to share improvements and opportunities, which will ultimately result in best practice.

Additionally, the ACRNA will have the profile to support the development and review of standards used in operating control rooms.

Holmes said the ACRNA will seek to collaborate with similar industry associations including the International Critical Control Rooms Association, the Australian Pipelines & Gas Association, and the United Kingdom Operations Managers Association.

He added that the association is looking to hold its first formal conference in Parramatta, Sydney, in late 2018.

Holmes said the association is inviting organisations that operate one or more control rooms to become corporate members, and those who work in the control room industry to become individual members. Members will have access to a special portal on the ACRNA website and will be able to take part in training and education courses, knowledge-sharing forums and industry forums.

ACRNA mission statement

The Australian Control Room Network Association (acrna.org) is a non-commercial industry association formed to support operators of Australian control rooms. Association members are encouraged to share ideas and experiences with the overall aim of achieving continuous improvement with the control room services delivered. The association, through its members, will facilitate discussion and interaction by means of conferences, webinars and meetings. All members of the association are encouraged to participate and support the activities of the association.

Applications environment

The Sepura AppSPACE applications environment is designed for critical communications.

The product delivers added capabilities to the current generation of the company's radios, which includes the SC20, SC21 and HTT-500-2 hand-portables, and the MDT-500-2 mobile terminal. This provides a more flexible approach and enables firmware-independent deployment of bespoke applications to radios.

Applications are deployed using the Radio Manager fleet management tool, ensuring that the process is simple, and completed in a cost- and time-effective manner.

The product is able to support multiple applications running concurrently — whether as a background task or those which directly engage with fleet radio users. Alerts and notifications ensure that both user and control room maintain continual awareness of critical information.

The product allows rapid deployment of custom-designed solutions which meet specific end-user requirements. This can be demonstrated in the delivery of application-based tools which automate manual processes and common critical tasks, ensuring that defined situation-based operations are enforced on the radio. Examples include radio location and geo-fencing, user health monitoring or automatic switching to emergency talk groups.

Sepura PLC

www.sepura.com

NG9-1-1 and FirstNet-compliant dispatch systems

Zetron has announced that its systems can deliver end-to-end communications in the USA in a fully standards-compliant life cycle, from NG9-1-1, into the command and control centre, and out to FirstNet. This enables public safety answering points (PSAPs) on Next Generation 9-1-1 (NG9-1-1) networks to receive and handle emergency communications beyond just voice.

The company's MAX Call Taking now supports fully integrated VoIP, Text To 9-1-1, robust location services and mapping technologies. Earlier in 2018, Zetron announced that its MAX Dispatch and ACOM Command & Control systems are FirstNet-ready.

MAX Systems also support network-integrated, broadband push-to-talk (PTT) interoperability with three of the four largest US cellular carriers, as well as interoperability with over-the-top PTT solutions, such as ESChat. Both MAX Dispatch and ACOM systems are also ready for IOC-1, pre-MCPTT integration with FirstNet, and are field-upgradable for future 3GPP Mission Critical PTT (MCPTT) interworking.

Zetron Australasia Pty Ltd

www.zetron.com

COMMS 2018 CONNECT
SYDNEY

INDUSTRY INSIGHTS

Jonathan Nally

A fascinating array of presentations and exhibits was featured at Comms Connect Sydney.

This year's Comms Connect Sydney conference and exhibition was held at a new venue, Rosehill Gardens (next to the racecourse) in western Sydney. There was a general consensus that the venue was far superior to the location used in previous years, and it was great to see the exhibition hall humming all day long.

There was a full program of speaker sessions, workshops and panels. Your author couldn't attend all of the sessions (as many were run in parallel), but here are some of the highlights from those I was able to attend.

Bill Schrier, who had just flown in from the US, gave us an update on FirstNet and the kinds of capabilities it will provide to first responders as the system matures. Ian Miller, who had recently attended the PCSE conference in Brussels, presented an overview of European public safety communications developments and their possible relevance to the Australian situation.

Giles Tanner from the ACMA gave us a good overview of the role and daily work of the Authority, and of some of the developments on the horizon as it grapples with the effect of new technologies and changes coming up in the new radiocommunications legislation. He also spoke at length about the ways in which it seeks to engage with the communications industry, and especially with bodies such as ARCIA. See the main feature article in this issue for an edited version of his presentation.

Surf and sea were on the agenda as Marcus Grinblat spoke about the history and operations of the Australian Volunteer Coast Guard, and Andrew Ugarte described the innovative technologies being used by Surf Life Saving NSW, whose 21,000 members in 129 clubs patrol more than 2100 kilometres of the New South Wales coastline.

Sohan Domingo (Nokia) spoke of how the future of mission-critical networks will involve not only the use of LMR networks but a combination of LMR and a PSMB (not commercial MNO) model to support day-to-day mission-critical operations, including voice. He described the benefits of a standalone, a hybrid PSMB network and the return on investment for customers implementing such networks.

Glen Norris (Orion Network) and Steven Oliver (Jemena) co-presented a very interesting case study on the use of two-way radio to boost the visibility and reliability of first responders within Jemena, a large utility company. Using some innovative solutions, the company has greatly improved the response time of its responders. Oliver gave one example where, following a car accident, Jemena's own staff were on the scene even before the ambulance could arrive.

They were followed by Ali Shamsizadeh (MCS Digital), who gave an overview of the communications and signalling systems being put in place for Sydney's new Northwest Metro train network. The network will use the TETRA standard.

The session on control rooms was very enlightening. Andrew Constantinou, Nevin Hecti and Paris Lehn from Sydney Trains gave us an insight into the complexities of controlling a rail network, of the vital role the organisation's control rooms play in it. A new control centre is about to go into operation at Green Square to the south of Sydney's CDB, and it looks like a lot of thought has gone into ensuring it is the best it could possibly be.

We also heard from Graham Tait from Fire & Rescue NSW, who treated us to a history of the agency's control rooms, and Mark Holmes (Circadian) announced the formation of the Australian Control Room Network Association (see the separate article in this issue). Other control room speakers included Geoff Spring (Centre for Disaster Management and Public Safety), Ged Griffin (Victoria Police), Graham Manson (International Resilience Group), Michael Kiernan (OnStar Emergency Services) and Les Scott (Zetron).

Paul Barnes from Fire & Rescue NSW provided a very interesting insight into the difficulties of introducing intrinsically safe devices. Due to the complexity of standards, maintenance requirements, the number of staff required to be trained and the geographical spread of firefighters across the state, the organisation has had to rethink its approach to the use of intrinsically safe radios.

He was followed by Tony Paul (PicoNet Consulting), who spoke about enhancing safe work at heights near radio sites. It's not all just about the danger of falling; it's also about the potential exposure to radiating antennas. He gave a couple of examples of unsafe practices that drew gasps from the audience.

The final session of the conference was a panel discussion on the way forward for public safety mobile broadband in Australia. Of great interest was the update provided by Luke Brown from the Department of Home Affairs. You can read a summary of his remarks in the article elsewhere in this issue.

Comms Connect Sydney will be back at the same time next year, but right now it is time to start thinking about Comms Connect Melbourne in November. If you are a potential speaker, workshop presenter or exhibitor, now's the time to make contact with the Comms Connect team to ensure your place. With all sorts of things hotting up in the communications space — eg, 5G, PSMB in Australia, spectrum reform and legislative change — it will pay to be at Australia's prime communications event to hear firsthand how these and other developments will affect you. See you there.

WIRELESS FACTORIES OF THE FUTURE

Researchers have released a guide to choosing the best wireless systems for industrial environments.

It's been called the 'smart factory' and even been given the lofty moniker of 'the Fourth Industrial Revolution'. The manufacturing operation of the just-around-the-corner future will be one in which networked systems monitor and direct processes, machines communicate with each other and with humans at high speeds, and the factory itself makes decisions about how to optimise and facilitate production.

Knowing that it will take reliable wireless communications to make it all happen, the US National Institute of Standards and Technology (NIST) has published the first ever set of science-based guidelines (https://dx.doi.org/10.6028/NIST.AMS.300-4) to help users select the best wireless system for any specific industrial environment, custom-design the set-up to make it work, successfully deploy it, and then ensure that the network performs as needed.

By eliminating physical connections such as wires and cables from a facility's communication network, wireless technology offers many manufacturing, chemical processing and utility organisations a means to run their entire operation more efficiently, more productively and at less cost.

However, concerns about reliability, integrity and security have hampered the adoption and use of industrial wireless, especially when wireless communication can often be disrupted by obstructions and interference in harsh industrial settings.

Through its Wireless Systems for Industrial Environments project, NIST is working with private-sector collaborators and standards organisations to overcome these obstacles and make industrial wireless communication the first choice for factories.

As part of this effort, in March 2017 NIST and the Institute of Electrical and Electronics Engineers (IEEE) organised a technical working group of experts on wireless communications from government, industry and academia to develop "a succinct yet comprehensive, easy-to-use reference guide and best practices manual for anyone, from control engineers to factory managers, to integrate a robust, safe, reliable and secure wireless system into their unique industrial landscape", said Rick Candell, an electronics engineer in NIST's Engineering Laboratory.

Candell said that the new how-to guide walks a user clearly and thoroughly through every step needed to achieve the best wireless fit for the specific operation. The document provides valuable background, strategies and tools that help users:

- understand wireless technologies and networking basics, including a glossary of terms, a review of RF considerations and a list of technical challenges (such as latency);
- make a business case for wireless;
- break down the components of a complete wireless life cycle, from the first defining of objectives to deployment and monitoring of the final system;
- use wireless to enhance factory safety;
- protect and secure a wireless network;
- learn about best wireless practices such as optimal antenna placement, getting around obstructions and interference problems and preventing redundant signal paths; and
- follow a set of easy-to-use checklists for each element of the wireless deployment life cycle, including evaluating the factory and its operations for communications needs, comparing available technologies, and methodically designing and deploying a working wireless system.

A series of best-practice case studies completes the guide, showing what strategies can be used to improve and optimise wireless in different factory situations.

> CONCERNS ABOUT RELIABILITY, INTEGRITY AND SECURITY HAVE HAMPERED THE ADOPTION AND USE OF INDUSTRIAL WIRELESS.

"For example, one scenario looks at a common but often overlooked problem when using wireless communications: dealing with the RF interference that may arise from microwave ovens, Bluetooth devices and other non-operational items that personnel are using," Candell said.

"The guide tells how to identify the sources of such interference, measure how they impact factory operations, and then use the data to choose the most appropriate solution from those described in the text."

Another case study described by the guide shows how properly deployed wireless could prevent a hazardous work environment.

"Wireless gas sensors can monitor the accumulation of poisonous or combustible gases in a work setting, but only if all of the signal transmission and propagation challenges in that area are considered," Candell explained.

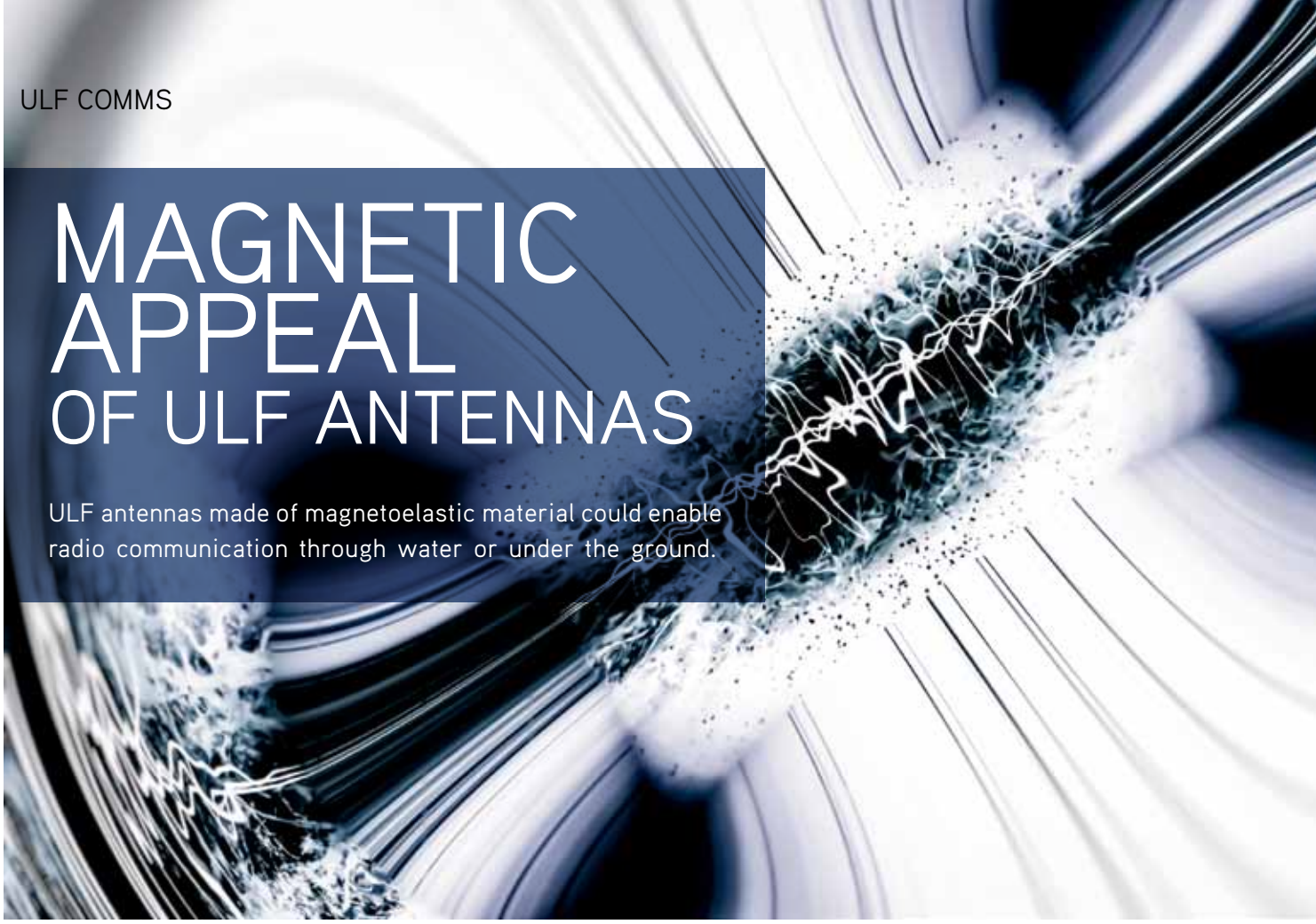
"We use the example of a welder in a confined space whose torch is producing carbon monoxide gas, and show how successful, continuous monitoring depends on critical factors such as antenna placement and the use of multiple sensors in case one fails."

Using a novel testbed that recreates factory environments in the lab, NIST engineer Rick Candell helps 'cut the cords' (and wires) from industrial communications networks by studying how different factory layouts affect wireless radio frequencies and, in turn, how this affects factory performance. Image credit: Earl Zubkoff.

Candell said that future guides from NIST will address more advanced communications scenarios, such as wireless technologies for control of mobile and collaborative robotics in the factory.

MAGNETIC APPEAL OF ULF ANTENNAS

ULF antennas made of magnetoelastic material could enable radio communication through water or under the ground.



Project AMEBA, the US Defense Advanced Research Project Agency (DARPA) initiative, aims to develop low-frequency radio transmitters that are far more compact and efficient than the large antennas used to communicate in traditionally radio-denied conditions.

While ultra-low frequency (ULF) wavelengths do not carry large amounts of data — typically short encoded messages — they could enable communication that is impossible with typical radio equipment, such as with divers, troops in caves or difficult terrain, or personnel housed underground.

"That's why people trapped in mines must communicate with the surface by tapping on pipes, because typical radio communication cannot be used," said Geoff McKnight, co-lead researcher on the project from HRL Laboratories' Sensors and Materials Laboratory. HRL Laboratories has received a contract to participate in project AMEBA.

The goal of the AMEBA project, which stands for A Mechanically Based Antenna, is to enable a communications system that transmits at less than a 1000 Hertz and is man-portable. This would enable communication deep underwater or underground, with the ease of a backpack-based system.

"For those people in mine disasters, or in buildings collapsed after earthquakes, a portable low-frequency beacon could also make a dramatic difference in search and rescue," said Walter Wall, project co-lead from HRL's Advanced Electromagnetics Laboratory.

"Mobile low-frequency communication has been such a hard technological problem, especially for long-distance linkages, that we have seen little progress in many years," said program manager Troy Olsson of DARPA's Microsystems Technology Office.

"With AMEBA, we expect to change that. And if we do catalyse the innovations we have in mind, we should be able to give our warfighters extremely valuable mission-expanding channels of communications that no-one has had before.

"If we are successful, scuba divers would be able to use a ULF channel for low bit-rate communications, like text messages, to communicate with each other or with nearby submarines, ships, relay buoys, UAVs and ground-based assets. Through-ground communication with people in deep bunkers, mines or caves could also become possible," Olsson added.

And because of the atmospheric waveguide effect, VLF systems might ultimately enable direct soldier-to-soldier text and voice communication across continents and oceans.

Magnetic antennas

Typical antennas are physically sized to resonate with the electromagnetic wavelength, which is convenient for portable communications at common radio and mobile phone bands with wavelengths of a metre or so.

"At ULF, the low frequency and the high speed of light combine to create a very long city-sized wavelength," McKnight said.

HRL's proposed antennas are also resonant, but use resonant acoustic waves, which travel about a million times slower than radio waves, to dramatically shrink the antenna size, weight and power, McKnight added.

"Other teams working on this problem are attempting to achieve a low-frequency wave by taking a permanent magnet and rotating or oscillating it. The mechanical motion of that magnetic moment is equivalent to a traditional antenna, which achieves an oscillating magnetic moment by oscillating large amounts of electrical current," McKnight said.

"Our approach is different because instead of physically spinning a magnet, our device is magnetoelastic, meaning the magnetic field oscillates within the material in response to acoustic stress waves, created through structural vibrations."

The HRL team's antenna will use materials that possess a quality called magnetostriction. This enables the material to be magnetised just like iron, but unlike iron, when magnetised this material elongates.

A reciprocal effect is that mechanical stress can be used to control the direction of the magnetisation inside the material. By vibrating the material, elongating and compressing, the magnetic field oscillates within the antenna without physically spinning it.

"We're just vibrating a stack of magnetic material and the magnetisation is flipping back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and forth in the material," Wall said. "These elastic forces allow us to control the magnetism."

One of the keys to transmitting information with the antenna is the ability to modulate the signal frequency. A physically spinning antenna begins to act like a flywheel and store energy due to inertia. High inertia makes such devices inherently frequency-stable, in turn making signal frequencies very hard to modulate. Vibrating systems are also very stable, hence their use in clocks.

But HRL recently discovered a mechanical way to rapidly shift the resonant frequency and the researchers propose to use that mechanism to rapidly modulate the transmitter frequency with relatively little electrical power.

"This is a pretty exotic project for us," Wall said. "When you consider that most wireless devices operate at a billion cycles per second, this system will work at a thousand cycles per second.

"It is a part of the spectrum most people don't think about much, but it is pushing HRL research in completely new directions, which is a nice thing as well."

Remote speaker microphone

The Wireless Pacific LTE Power Mic is a remote speaker microphone with 1 W of audio output designed for the Icom IP100H and Icom IP501H two-way radios.

The LTE Power Mic enables users of the Icom IP100H and Icom IP501H radios to be able to now use this particular Icom range of radios in noisy work environments, such as construction sites or industrial manufacturing environments, where they require both loud and clear audio.

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CO-EXISTENCE OF TERRESTRIAL AND SATELLITE COMMS

John Stanton, CEO, Communications Alliance

Can terrestrial and satellite services live in the same band, avoiding interference while maximising the value of the spectrum?

Life would be a lot simpler in a world where electromagnetic spectrum was an infinite resource. Most of the clutter and inconvenience associated with building and maintaining fixed networks would melt into the past as we surged forward on a harmonious, wireless wave of technological progress.

One of the drawbacks of being able to rewrite the laws of physics in this way, however, would be that it would rob us of the wonders of the 'black art' otherwise known as spectrum management.

One has to feel more than a little sympathy for the ACMA, which is charged with orchestrating the best and most efficient use of the spectrum available to Australians, in the national interest.

It is a fiendishly complex, constantly morphing and mostly thankless task. The landscape is littered with powerful interest groups all vying for a piece of the action and all utterly convinced about what they perceive as the primacy of their individual requirements.

Imagine having to navigate on a daily basis across the competing demands of television broadcasters, big telcos, the defence forces, the scientific and meteorological sector, national broadband operators such as nbn, cabinet ministers, satellite operators, state governments and emergency services agencies, the commercial radio industry, national surveillance and security agencies… to name but a few.

What's more, having to do this in an environment where countries such as Australia need to attempt to harmonise with spectrum decisions being made on a global basis… all while also trying to anticipate how rapidly the relentless evolution of technology and services will render yesterday's and today's decisions obsolete.

It's a nightmare, really.

In a bid to bring some sense of order to the chaos, the ACMA publishes each year its Five-Year Spectrum Outlook (FYSO) document. This is a weighty tome that seeks to lay out the terrain and the multitude of issues and considerations that will inform the debate and decisions on how spectrum is divided, regulated, priced and used in the Australian arena during coming years.

The ACMA is now deeply immersed in consultation with industry around the draft version of the next FYSO, to be published later in 2018.

Looming also is the long-awaited introduction of a rewritten Radiocommunications Act, the legislation that oversees the whole process. This promises a simplified and more agile spectrum licensing regime to address many of the long-held criticisms of the difficulty of doing business with government in this area.

The ACMA faces a daunting array of new and powerful dynamics that are shaping the industry. The demand for spectrum for mobile broadband is exploding, driven by year-on-year increases of 30% or more in the volume of data being uploaded and downloaded. The distinction between fixed and mobile broadband is increasingly difficult to discern. The impending introduction of 5G mobile technology will exacerbate these trends and complicate spectrum management further as mobile networks densify to accommodate higher data loads.

And now the Internet of Things (IoT) is arriving, with the potential to tip the whole circus on its head. Increasingly we will see IoT-based networks and applications using thousands, even millions of sensors in a single network — all with a requirement for wireless connectivity that is affordable and narrowband in nature. So, it's a challenge pretty much the opposite of the 'broadband is good' mantra that the nation has embraced during the past decade.

Meanwhile, massive new investments are being made around the world in new satellite technologies, many of them designed to operate at low and medium orbits with the objective of providing global or regional broadband services at low latencies that can better compete with terrestrial broadband. The O3B satellite network is already in place, providing broadband services to customers that are among the 'other 3 billion' people in tropical regions either side of the equator. The OneWeb network is close to launch and Elon Musk has incredibly ambitious plans for his Starlink project — a constellation that could one day use almost 12,000 small satellites to provide global broadband services.

More traditional geostationary satellite operators are also experiencing strong growth in their businesses, but have the misfortune of being squarely in the sights of terrestrial mobile broadband providers, who want to capture growth territory in frequency bands that are being used for satellite services.

This has focused debate on to what extent co-existence is possible — in other words, which frequency bands can be used in ways so that terrestrial and satellite services can live alongside one another in the same band, tailored and managed to avoid interference while simultaneously maximising the value of the chunk of spectrum and the number of end users it can service?

Current interest is focused in the so-called 'millimetre-wave' bands above 24 GHz, where ka-band satellite services and other applications exist, and where spectrum is being sought (both in Australia and overseas) for 5G applications.

Earlier decisions have seen the reallocation of spectrum for 5G in the 3.6 GHz band — a move that will displace some satellite players and wireless service providers.

The argument goes that 5G services and IoT-based services — the next two great global disruptors — will not succeed fully unless there is some complementarity between what operates in space and what operates on the ground. Hence the perceived urgency of the task.

Early industry feedback on the ACMA's latest work in the spectrum space — as reflected in the draft 2018 FYSO — has been positive. It will take a strong collective effort by a host of stakeholders to solve the riddles in full.

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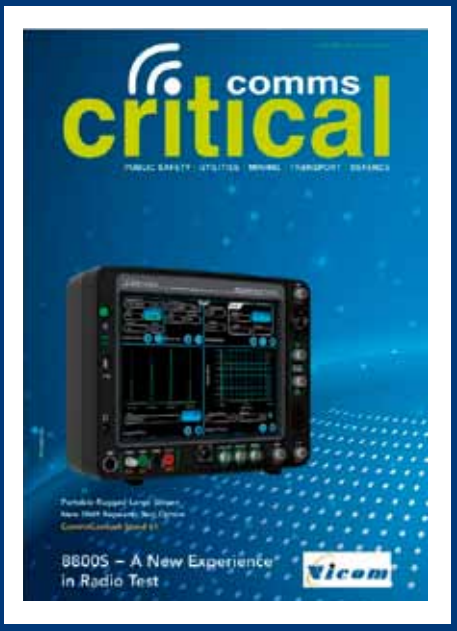

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PoC communications

Vertel PoC is a fully managed PoC service designed for instant group communications.

The service takes aspects of LMR and integrates them with the capability of mobile phone networks to deliver an enhanced mobile communications tool with a broad voice, data and video feature set.

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The Vertel PoC solution is a tightly integrated bundle of hardware, multiple carrier networks, a PoC application and professional services. The PoC service is designed to meet critical network requirements today, as well as emerging mission-critical push-to-talk (MCPTT) standards in future.

The service can be run on Android, iOS or Windows platforms and includes a growing range of certified smartphone, tablet and simple, two-way radio form-factor devices.

The service can be integrated into existing LMR networks via 'standards-based' network gateways and is optimised to operate across multiple public carriers and private mobile networks, delivering enhanced coverage, and improved in-building and in-tunnel reception. A mobile device management platform has been integrated for 'over the air' configuration and optimisation.

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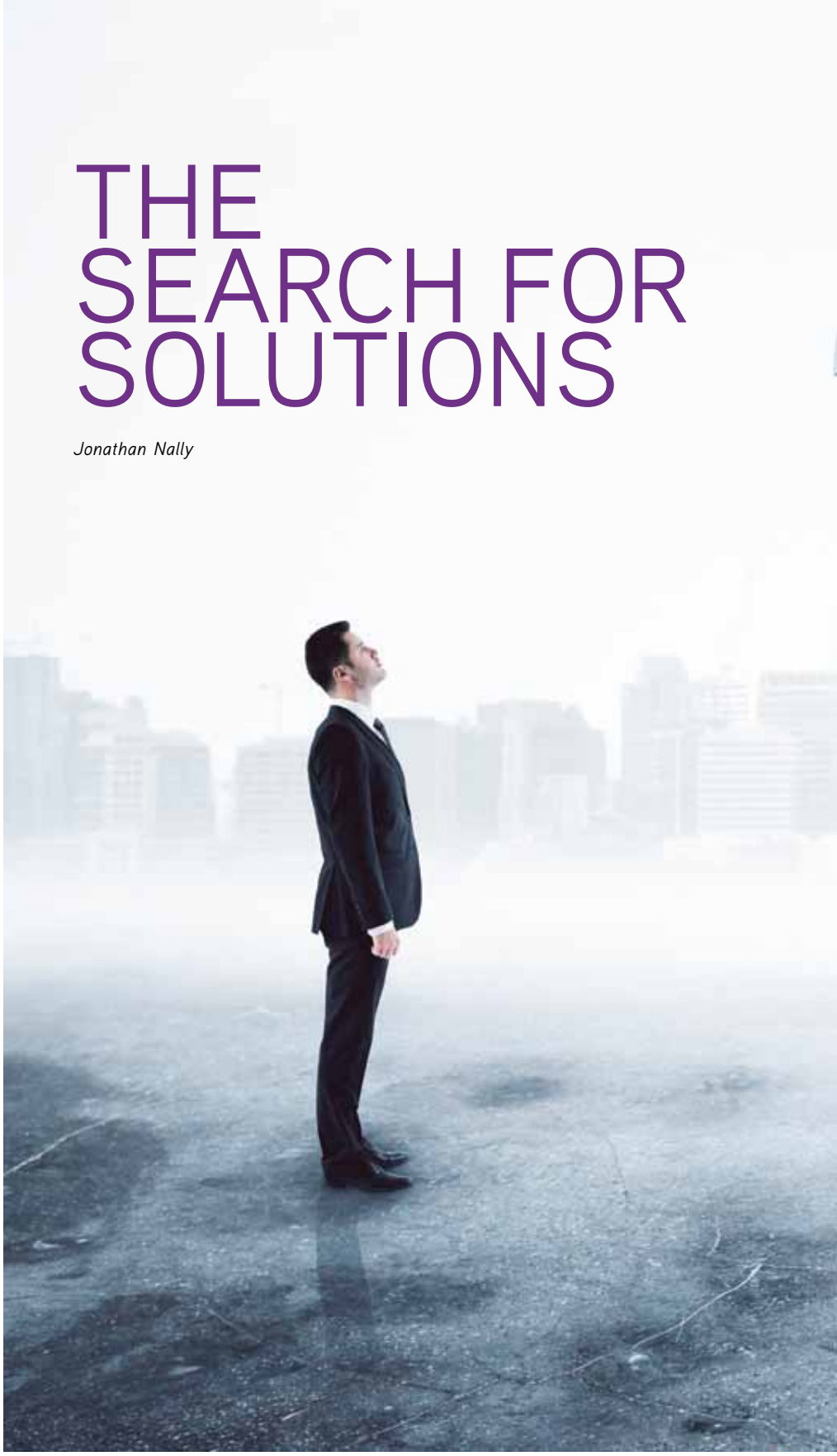
THE SEARCH FOR SOLUTIONS

Jonathan Nally

Norway and India are very different countries, and consequently are looking at different PSMB solutions.



The pace of public safety communications evolution is picking up around the world. Out in front is the FirstNet mobile broadband network in the US, which has gone live and already has 1000 public safety agencies (out of around 60,000 across the nation) signed up to it. The UK, South Korea, Mexico and others are progressing their own versions of public safety mobile broadband (PSMB) and, as you can read in this issue of Critical Comms, a decision on Australia's long-awaited solution might be forthcoming by the end of this year.

Interestingly, the UK and the US have gone with the commercial carrier solution. Others — including, it seems, Australia — are thinking about a hybrid solution. There will not be a one-size-fits-all solution, as each country has unique circumstances of geography, population, infrastructure and so on.

But it is interesting to see what two very different nations, Norway and India, and contemplating. Both have recently released information about possible solutions.

Norway weighs up its options

Norway's Directorate for Civil Protection (DSB) issued a paper in May describing alternatives for implementing a possible mission-critical mobile broadband communications system via commercial mobile networks.

In December last year, the Norwegian Government decided to allocate the 700 MHz band to commercial telcos, meaning that a "dedicated broadband network for mission-critical use is no longer an option in Norway," according to the paper's authors.

Norway's current narrowband network, Nødnett, uses TETRA technology and has some impressive statistics (2015 figures):

- 2100 radio sites
- 55,000 users
- 322 road tunnel installations
- 255 emergency call centres for police, fire and health services
- Coverage: area, approximately 86%; population, effectively 100%

"DSB is currently doing a concept study for the realisation of a robust and secured broadband data solution to Norwegian public safety and emergency preparedness organisations," the paper says.

"It is the vision that in a longer term, the solution will also carry voice services and substitute the present Nødnett. The term "Next Generation Nødnett" (NGN) is used... to describe such a network solution."

The paper summarises input received from industry and other involved parties, and sets out several options for the provision of mission-critical mobile broadband.

"The dialogue with the Norwegian mobile operators has illustrated that there are many considerations to make in order to find the best solution for a mission-critical broadband system inside commercial mobile networks," the authors state.

"A number of commercial and technical arrangements are possible, and further assessments are required."

The paper is available for download from the Nødnett website (nødnett.no/en/About-The-Directorate/News-Archive/Document-about-the-realisation-of-Next-Generation-Nodnett/).

India looking at hybrid

In June, the Telecom Regulatory Authority of India (TRAI) issued its recommendations for the provision of a nationwide public protection and disaster relief (PPDR) communications network.

The development followed industry consultations in December 2017 and February 2018. Based on those industry inputs, the TRAI has recommended that the Indian Government set up a pan-India integrated broadband PPDR (BB-PPDR) communication network (to be called the 'National BB-PPDR Network') based on 3GPP PS-LTE technology.

According to the TRAI, a hybrid network should be put in place in which a dedicated BB-PPDR communication system, funded by government, is deployed in cities, border districts, disaster-prone areas and sensitive areas, while existing commercial networks could be leveraged in other regions.

The Authority says that stringent SLAs should be put in place and that operators should be required to provide mobile BTS and backpack devices in case the terrestrial network is damaged or destroyed.

A Special Purpose Vehicle (SPV) under Ministry of Home Affairs (MHA) should be set up to plan, coordinate and steer the network's implementation and its subsequent operation, and an advisory committee should be formed that includes representatives from public safety, state governments, the central government and the Ministry of Communications.

In terms of spectrum, the TRAI says 2x 10 MHz of dedicated spectrum should be allocated nationwide to the SPV on a no-cost basis — this should be in the 814–824/859–869 MHz range. And 20 MHz in the 440–470 MHz (preferably 450–470 MHz) range should be allocated for future evolution of broadband PPDR.

Other recommendations include:

- The Department of Telecommunications (DoT) should study the feasibility of a phased withdrawal of captive mobile radio trunking service licences for PPDR agencies.
- SPV should be the nodal agency to co-ordinate with the DoT for allocation of spectrum and other issues. The PPDR agencies and details of equipment deployed by them can be registered with DoT through SPY.
- The DoT should work out timelines to phase out existing analog networks used for PPDR. New spectrum assignments may be made only for the deployment of digital equipment.
- Pilot testing of the BB-PPDR dedicated network (dedicated spectrum and network) should be funded by the central government, at five zones identified as disaster-prone sensitive areas, to evaluate the efficacy of the proposed network.
- Testing of the efficacy of PPDR trunking service roaming on public telecom networks should be done during pilot testing, and if found feasible, it should be implemented on pan-India basis.

Detailed information and the full recommendations are available on the TRAI website (trai.gov.in/notifications/press-release/trai-releases-recommendations-next-generation-public-protection-and).

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Artist's impression of a GPS satellite. Courtesy Lockheed Martin.

THE INTERNET OF SATELLITE THINGS

German scientists have demonstrated low-power satcom connectivity for IoT applications.

Germany's Fraunhofer Institute for Integrated Circuits IIS has successfully demonstrated the direct transmission of sensor data from multiple transmitters via a geostationary satellite. For the test transmission, the institute employed portable, ground-based transmitters equipped with small, omnidirectional C-band antennas.

Fraunhofer IIS developed this particular transmission method specifically for Internet of Things applications that use satellites (Satellite IoT).

The particular challenges associated with using GEO satellites for IoT applications are, first, the vast distance between the transmitters and the satellites (about 36,000 km) and, second, that satellites in orbit tend to use the same frequencies. This is why antennas on the ground must be relatively large, with high amplification and suitable directional capabilities, to minimise interference to neighbouring satellites and systems.

The transmission concept used for the technology demonstration makes it possible to establish a direct connection from IoT sensor nodes to a GEO satellite using portable transmission terminals equipped with a small, omnidirectional C-band antenna developed at Fraunhofer IIS.

The waveform has been specially optimised for low data rates and enables successful data transmissions even at extremely low transmit power.

Using this C-band antenna (foreground), Fraunhofer IIS successfully transmitted sensor data via a geostationary satellite. Credit: Fraunhofer IIS/Sabine Metzger.

Transmit power has been reduced enough for the waveform to be transmitted below the threshold mandated for C-band communications. This makes omnidirectional antennas a viable option, since they require no alignment and will still not interfere with other satellite systems.

The solution's real advantage is that it can be operated using small, cost-effective transmitter and receiver terminals that offer long battery life.

IoT connectivity via satellite is the most practicable solution in situations where small amounts of data have to be transmitted and no mobile communications or terrestrial IoT network infrastructure is available.

The demonstration using GPS data from individual sensors showed that in the future, Satellite IoT can also be used for blue force tracking (a US military term for a GPS-enabled capability that provides location information about military forces).

Other potential applications include temperature and humidity monitoring in agriculture and condition monitoring for oil and gas infrastructure for maintenance purposes and to detect leaks early on.

Future developments should make it possible to add the transmission of IoT data to regular satellite operations without having to increase satellite capacity. This means that global IoT applications could make use of existing satellite infrastructure.

COLLABORATIVE COMMS: THE US EXPERIENCE

When disasters span multiple jurisdictions, coordination and collaboration becomes critically important for effective responses.

During emergencies, reliable communications are critical. Disasters, such as 2017's hurricanes, continue to test the US's emergency communications capabilities. As disasters can cross jurisdictional boundaries, collaboration within and across regions is very important.

The US Government Accountability Office (GAO) was asked to review implementation of the Post-Katrina Act's provisions related to disaster preparedness, response and recovery. The result is the report 'Emergency Communications: Increased Regional Collaboration Could Enhance Capabilities'.

The report examines:

1. Challenges related to emergency communications that selected stakeholders have experienced.
2. Their views on DHS's emergency communications assistance.
3. The regional working groups established by the Post-Katrina Act and their effect on emergency communications capabilities.

The GAO reviewed Department of Homeland Security's (DHS) reports and grant data for fiscal years 2011–16 and conducted case studies of three cities — Houston, Los Angeles and Boston — selected based on the number of declared disasters, DHS grant funding and geographic diversity.

GAO interviewed DHS officials; leaders of all 10 regional working groups and other stakeholders, including public safety officials in the case study cities; and others chosen for their expertise.

Findings

Selected first responders and public safety officials identified various challenges related to emergency communications. These challenges include attaining the interoperability of communication systems, obtaining funding, ensuring ongoing training and increasing the emphasis on communications during emergency response exercises.

For example, some stakeholders told GAO about challenges related to equipment that is not interoperable, and others said first responders need training after investments are made in new interoperable communications equipment.

To help address these challenges and as required by the *Post-Katrina Emergency Management Reform Act of 2006* (Post-Katrina Act), the DHS has provided technical assistance, such as training, and Federal Emergency Management Agency (FEMA) grants. It has also established regional emergency communications coordination working groups, which bring together stakeholders from different levels of government and the private sector within FEMA's 10 regions.

While emergency communications challenges persist, stakeholders told GAO that DHS's technical assistance generally meets their needs and that FEMA grants have helped them enhance emergency communications capabilities. In particular, stakeholders found training for specific communications positions was useful.

Houston-area officials said this training was critical in preparing first responders for Hurricane Harvey. Some stakeholders told GAO that FEMA grants helped them address needs that would otherwise go unfunded, including interoperable communications networks and equipment.

GAO found that the regional working groups have enhanced emergency communications capabilities through building relationships and sharing information. Within the respective regions, group members have:

- assisted each other during disasters and emergencies;
- developed technical solutions to enhance interoperability; and
- addressed policy concerns, such as the use of interoperable radio channels during emergencies.

However, most regional group leaders told GAO that more collaboration across the groups was needed. GAO's prior work has also found that including all relevant participants can enhance collaborative efforts. Further, DHS's strategic plan for emergency communications established a vision of collaboration among stakeholders across the nation.

While FEMA has encouraged collaboration among regional working-group leaders, cross-regional efforts have been limited and do not involve all group members. Developing and implementing an appropriate ongoing mechanism for collaboration could enhance emergency communications capabilities, such as by helping group members address common challenges.

Without ways for all members of these groups to collaborate across regions, members may be missing opportunities to share information and leverage the knowledge and experiences of their counterparts throughout the US.

Conclusions

When disasters strike or emergencies arise, they can span multiple jurisdictions, making coordination and collaboration critically important for effective emergency response. The regional emergency communications coordination working groups (RECCWGs) established by the Post-Katrina Act have enhanced emergency communications within their regions.

While the relationship building and information sharing within these groups have contributed to benefits at the regional level,

Surveying the scene after Hurricane Katrina. US Air Force photo by Staff Sgt. Manuel J. Martinez.

Right: Virginia Task Force 1 Rescue Specialists confer in the aftermath of Hurricane Irene. FEMA Photo by David Fine.

nationwide collaboration among the groups has been more limited. Such collaboration could help the groups address common challenges by providing a way to improve the sharing of best practices and lessons learned and to allow members to leverage the knowledge and experience of their counterparts to improve emergency communications capabilities in their regions and nationwide.

Therefore, it could benefit FEMA to work with these groups to reach consensus on and to implement a mechanism for accomplishing cross-regional collaboration. A concerted effort focusing on these groups' collaboration needs, while also considering FEMA's resource constraints, could help FEMA and regional stakeholders determine an appropriate mechanism for collaboration moving forward.

In several instances, RECCWG members have reported assisting each other during disasters and emergencies, drawing on the relationships and information sharing fostered by the groups. For example, a member of the Region I group, which includes New England, told the GAO that prior to his group's formation, emergency communications stakeholders from different levels of government in that region did not meet. However, because of the relationships the regional group helped to build, these stakeholders now meet regularly to develop communications plans for large planned events and have collaborated to provide communications support in responding to the Boston Marathon bombing in 2013, Hurricane Sandy in 2012 and other events both within and outside of the region.

According to a leader of the Region X group, relationships developed in the group were also helpful in responding to wildfires in Washington State in 2014 and 2015. In addition, after Hurricane Matthew and a major flood in 2016, Region IV group members drew on relationships developed in the RECCWG to coordinate support from other states in the region to assist South Carolina, according to a leader of that group.

Nearly all of these groups (9 of 10) have shared or are working to share information about resources that can be deployed during a disaster. At least three regions have consulted these resource compilations during recent disasters. For example, according to the 2016 RECCWG annual report, this information was used during Hurricanes Hermine and Matthew in 2016, severe storms and flooding in Minnesota and Wisconsin in 2016, and severe winter storms in New England in 2015.

The report's overall final recommendation is that FEMA should work with regional working-group members to reach consensus and implement an ongoing mechanism, such as a national-level working group, to encourage nationwide collaboration across regions. The DHS has concurred with this recommendation.

This article is adapted from the GAO report, 'Emergency Communications: Increased Regional Collaboration Could Enhance Capabilities', issued April 2018.

Industry Talking

The next major ARCIA networking event will be in Brisbane on Thursday, 26 July at Rydges Hotel, Southbank. This is your chance to support the industry and network with your colleagues. Special guests will be presenting on the importance of LMR communications during the Commonwealth Games held on the Gold Coast earlier this year. Head to the ARCIA website for all the details, and let's make this another great ARCIA Queensland night.

Over the first few months of 2018 I have been fortunate to be able to attend conferences in Australia and overseas. I have attended Comms Connects in Perth, Auckland and Sydney, IWCE in Florida and finally Critical Comms in Berlin. As well as watching almost every movie on Qantas in-flight entertainment, it has been very pleasing to see innovation across multiple markets. There is so much happening in standards, hardware and software. This is not just the domain of LTE markets; I believe we are witnessing the realisation that there is a long way to go before LTE can be used to replace the entire LMR ecosystem.

The growing awareness that LMR technologies will have relevance for critical communications for a long time to come is encouraging companies to invest in hybrid solutions so that end users can take advantage of existing and new technologies.

Our industry is so broad and over the last 100 years has been adapted in so many ways to suit different market segments. You simply can't replace all these diverse requirements with consumer devices. Of course, LTE offers incredible opportunities for many user groups and new ways of delivering services. However, it is the combination of the best available options that will have the potential to drive new market opportunities.

As we move into the next couple of months, several of our members will be involved in school careers events, both in Victoria and New South Wales. Our members report that this is very satisfying and we are keen to promote work experience as an option to students to let them learn about the wireless world. If you would be prepared to host an occasional student for some work experience please let us know, as we see this as a way of bringing new blood into our industry.

The next major item of work for ARCIA is to engage with the ACMA on the new Radiocommunications Act. How the new Act will be implemented and the effect it will have on markets is very important to our members and the industry in general. The ACMA is aware that industry needs time to adapt to new legislation and it is pleasing to report that ARCIA is engaging with regulators.

We anticipate there will be a heavy workload in the second half of 2018 as we review all this detail. We encourage all members and supporters to engage in the debate, and if you have any concerns or questions, please raise them with the ARCIA executive committee.

Finally, I would like to thank all of the ARCIA committee members all over Australia who give up their time for the benefit of the industry. The commitment shown by these people is outstanding and is the key reason that ARCIA continues to operate effectively.

Hamish Duff, President, Australian Radio Communications Industry Association

Dual SIM router

The D-Link ANZ DWM-312 4G LTE M2M dual SIM router has advanced VPN capabilities.

The router provides 4G LTE mobile broadband with redundancy and flexibility for machine-to-machine (M2M) applications via its dual SIM architecture, is easy to deploy and provides a dedicated fast Ethernet port for local connectivity. The unit also supports both Telstra 4GX and Optus 4G Plus LTE networks.

The product also features VPN tools and remote management, which, combined with its ease of use, makes it suitable for both large-scale and individual deployments.

Key features include flexible dual SIM design; robust, industrial-grade, corrosion-resistant enclosure; 2 x detachable SMA LTE antennas; 4G LTE spectrum support: 700/800/850/900/1800/1900/2100/2300/2600 MHz; 4G LTE band support: 1/2/3/5/7/8/20/28/38/40 bands; 3G/UMTS spectrum support: 850/900/1900/2100 MHz; user-friendly web interface; advanced VPN support: client and server; and IPsec, PPTP, L2TPv2, GRE support and SNMP management support.

The product enables users to easily connect to high-speed 3G/4G LTE mobile connection and enjoy fast downlink speeds of up to 150 Mbps and uplink speeds up to 50 Mbps, according to the company. The product can be deployed in virtually any location to enable access to devices such as IP cameras, in-vehicle transportation systems, emergency services equipment or exhibitions that require fast, yet portable internet access, all with configurable dual-SIM fallback that is designed to provide reliability and flexibility across potentially mixed mobile networks.

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A flexible and dynamic transport solution for 5G communications has been developed by European partners.

5G-CROSSHAUL PROJECT A SUCCESS

A consortium of 20 companies and organisations has announced the successful completion of the European research project 5G-Crosshaul, coordinated by Universidad Carlos III de Madrid (UC3M).

The three-year effort has delivered a de facto concept for an integrated 5G transport network, a crucial step towards the real-world implementation of the future 5G communications system.

The 5G-Crosshaul consortium was selected in 2015 to develop a 5G transport network that would integrate backhaul and fronthaul, two typical segments of 4G networks.

In 5G, these two segments merge into what is known as crosshaul to enable a flexible and software-defined reconfiguration of all networking elements in a multitenant, service-orientated and unified management environment.

The 5G-Crosshaul transport network flexibly interconnects distributed 5G radio access and core network functions hosted on in-network cloud nodes. This configuration is achieved through the implementation of a control infrastructure coupled with a unified data plane, encompassing innovative high-capacity transmission technologies as well as novel deterministic-latency switch architectures.

The researchers say that, thanks to that integration, they can move a huge amount of data in a very short time, and can do it by controlling how long it takes to perform the process.

"It has been truly an honour to oversee one of the most ambitious 5G transport network research and development efforts to date," said the Coordinator of the 5G-Crosshaul project, Arturo Azcorra, Professor at the Telematics Department of UC3M and Director of IMDEA Networks.

"The successful results of the 5G-Crosshaul project have advanced scientific knowledge and the international standardisation of 5G systems. They have ultimately contributed to an increase in Europe's global competitiveness in 5G."

The 5G-Crosshaul solution was demonstrated and validated through 18 experiments integrating multiple technology components from the project partners. Real-world trials took place at sites in Berlin, Madrid, Barcelona and Taiwan, and delivered sub-millisecond latency, tens of Gbps throughput, and proven energy and cost savings of up to 70%, depending on the deployment scenario.

The trials also demonstrated fast service deployment time in the order of minutes, taking advantage of SDN and NFV concepts.

"The 5G-Crosshaul project has delivered a novel transport network that provides

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> "IN THE ONGOING AND UPCOMING 5G ROLLOUTS — NOT JUST IN THE EU, BUT GLOBALLY — THE IMPORTANCE OF THE TRANSPORT NETWORK MUST NOT BE OVERLOOKED." — THOMAS DEISS, NOKIA

overall resource optimisation and brings capital and operational expenditures to a reasonable return of investment," said Xavier Costa, Head of 5G Networks R&D and Deputy General Manager of the Security & Networking R&D Division at NEC Laboratories Europe.

"The level of innovation achieved has set the stage to deliver the huge increase on the available bandwidth and the ultralow-latency required by the fifth generation of network technologies."

Following the final project review, which was held at the R&D+i 5TONIC laboratory headquartered at IMDEA Networks and performed by independent experts appointed by the European Commission, the 5G-Crosshaul project was reported to "have fully achieved its objectives and milestones and delivered exceptional results with significant immediate or potential impact".

The EU experts' report also highlighted the production of 91 scientific publications in several prestigious journals, 74 presentations at international venues, 28 demonstrations (including several made at flagship events such as the Mobile World Congress) and 35 contributions to international standardisation bodies, amongst other results.

The report also noted that "several key innovations have been identified, and some of them have been mapped to products for exploitation. The project has so far registered five patent applications. Future exploitation plans are expected to emerge from the partners, outside the project umbrella and based on these innovations."

"Throughout its lifetime, the 5G-Crosshaul project has successfully delivered 60-plus technological and informational contributions to the advancement of 5G standards," said Paola Iovanna from Ericsson and the project's Innovation Manager.

"The project produced radical technological innovations, several directly mapped to products, setting this project as one of the most groundbreaking and unique projects to date."

"The project's relevance will go well beyond its impressive track record of having brought together a diverse set of parties from all parts of the 5G ecosystem to deliver advanced research complemented with an innovative set of demonstrations," said Thomas Deiß, from Mobile Networks, Nokia.

"In the ongoing and upcoming 5G rollouts — not just in the EU, but globally — the importance of the transport network must not be overlooked; 5G-Crosshaul made significant contributions towards that recognition, while keeping a holistic perspective on all technologies that are shaping the mobile transport networks of the future."

The project received funding from the European Union's Horizon 2020 Research and Innovation Programme.

Backhaul

Take a trip down memory lane as we look at what was happening in the comms sector of yesteryear.

25 YEARS AGO. The cover of the August/September 1993 issue of *What's New in Radio Communications* featured the Transcom Communication System MD3000 mobile data terminal and associated mobile data link controllers, suitable for users looking for a turnkey data solution. Inside the magazine, we reported on Optus Communications and Gascoyne Trading (a transport company) announcing Transtracs, a satellite service that would track vehicles and also send back data on engine parameters, speed and so on. We also reported on Motorola Communications relocating its Victorian land mobile sales and national parts divisions from West Melbourne to South Melbourne, with the company's headquarters to shift to Scoresby. Telstra Marine announced the availability of two new Radphone channels (12 and 16 MHz) for land and maritime use. And speaking of Telstra, it was announced around this time in 1993 that Telstra Corporation Limited was the new name for the Australian and Overseas Telecommunications Corporation, which had been formed from the merger of Telecom Australia and OTC.

10 YEARS AGO. The cover of the July/August 2008 issue of *Radio Comms Asia-Pacific* featured the launch of the Motorola MOTOTRBO, "a digital alternative that turns the traditional two-way radio into a trackable IP-based communications workstation". In this issue we reported on the ACMA developing a draft marketing plan proposing a revised technical framework (or operating conditions) for spectrum licences in the 2.3 GHz band, which would enable allocation of residual, unencumbered spectrum in the band in rural and remote areas of Australia. Simultaneously, major changes to the 403–520 MHz spectrum range were being mooted, and the ACMA was looking at measures needed to achieve a better balance between government and broader community use of the radiofrequency spectrum. A three-day ACMA conference, headed by Authority chair Chris Chapman, was held in Melbourne to discuss these and other spectrum matters.

Spectrum

Is it time for a public safety blockchain?

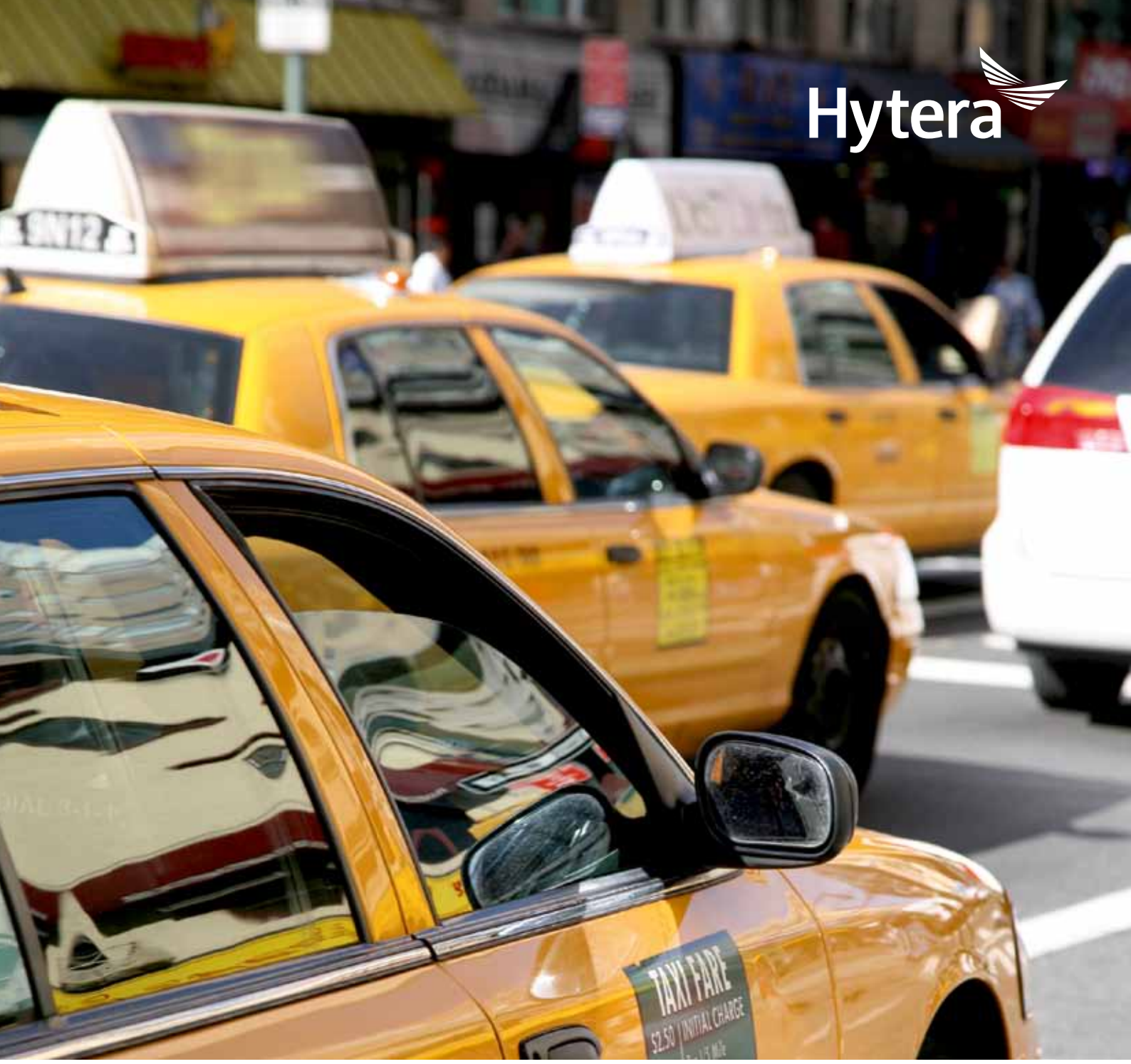
Communications technology is rapidly changing and having an enormous impact on our lives. And even though it is difficult to accurately predict the future due to the pace of change, we can see some themes emerging. Certainly the Internet of things (IoT) and the smart cities movement are giving us some insight into the potential of new sensors and sensor networks — for example, new smart buildings that collect and share observations or data in real time. Machine-to-machine (M2M) communications are a key element in driving these innovations by supporting billions of interactions between autonomous devices to forge new efficiencies.

The biggest shift underway within the global public safety communications community is the emergence of public safety mobile broadband (PSMB) communications networks. As part of this shift, officials are starting to consider new sources of information that may become available as the next generation of communication ecosystem emerges. Technology and data from the IoT and smart cities movement is an obvious area of interest, but officials are now using terms like the Internet of Public Safety Things (IoPST) or the Internet of Life Saving Things (IoLST) to describe a discrete subset of sensors and sensor networks that provide data relevant to various aspects of public safety operations and to protect life. While access to new data sources is very appealing, the integration of the potential vast range of sensors and sensor networks also introduces new challenges and potential vulnerabilities.

When dealing with mission-critical systems such as the public safety communications ecosystem, each component needs to be protected to ensure that it is available where and when it is required. Similarly, data provenance and accuracy are key concerns when making critical decisions during life-threatening situations. Trust, security and privacy (TSP) protocols are a key element of any reliable communications network, the approaches to which may vary depending on the scenario to ensure the protection of integrity, availability, confidentiality, non-repudiation and user privacy. For example, encryption and firewalls are common TSP elements within public safety communications networks.

In recent years blockchain has emerged as a significant technology in the financial services industry. Blockchain enables trust in the trustless environment of the internet. Blockchain-based smart contracts also allow the automated execution of processes when conditions are met. The key question is whether or not blockchain technology meets the business needs for trust within the new PSMB-enabled ecosystem. The establishment of automated processes through smart contracts, and auditable transaction records with the owners of both public and private sensors, will support the integration of IoPST and IoLST into this communications ecosystem. This will ensure that authorities can trust the information and sensor data they receive. Hopefully, it will also help to detect any nefarious attempt to introduce a false data feed into the communications ecosystem. At the University of Melbourne, representatives of the Centre for Disaster Management and Public Safety and the Academic Centres of Cyber Security Excellence are starting to examine the potential benefits of creating a public safety blockchain.

Ged Griffin is an Inspector in the State Emergencies and Security Command of Victoria Police. He is also manager of the Centre for Disaster Management and Public Safety at the University of Melbourne.



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